

# ***Iowa State University***

## ***Courses and Programs Catalog 2023 - 24***

### ***The Iowa State University Catalog***

The Iowa State University Catalog is a one-year publication which lists all academic policies, and procedures.

The catalog also includes the following: information for fees; curriculum requirements; first-year courses of study for over 100 undergraduate majors; course descriptions for nearly 5000 undergraduate and graduate courses; and a listing of faculty members at Iowa State University.

New courses developed and offered since catalog publication can be found on the Web at <http://www.registrar.iastate.edu/faculty-staff/courses/explisting>.

Every effort has been made to make the catalog accurate as of the date of publication. However, all policies, procedures, fees, and charges are subject to change at any time by appropriate action of the faculty, the university administration, or the Board of Regents, State of Iowa.

Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, genetic information, sex, marital status, disability, or status as a U.S. veteran. Inquiries regarding non-discrimination policies may be directed to the Director, Office of Equal Opportunity, Title IX/ADA Coordinator, and Affirmative Action Officer, 3350 Beardshear Hall, Ames, Iowa 50011, Tel. 515 294-7612, email [eooffice@iastate.edu](mailto:eooffice@iastate.edu).

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# ABOUT THE CATALOG

The Iowa State University Catalog is a one-year publication, which lists all academic policies, and procedures. Versions prior to 2011 were two-year publications and available in hard copy as well as online.

The catalog also includes information for fees; curriculum requirements; first-year courses of study for over 100 undergraduate majors; course descriptions for nearly 5000 undergraduate and graduate courses; and a listing of faculty members at Iowa State University.

New programs may be offered in the term (semester or summer session) following final approval by the Board of Regents, State of Iowa and any required accrediting bodies. New courses developed and offered since catalog publication are called experimental courses. A list can be found on the Web at [www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://www.registrar.iastate.edu/faculty-staff/courses/explisting/). (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

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## Updates to the Catalog

The curriculum process is governed by the Faculty Senate. The ad hoc committee, Faculty Senate Curriculum Committee (<http://www.facsen.iastate.edu/councils/academicaffairs/curriculum/>) considers new curricula proposals, changes and discontinuations to the catalog. Additional information may be in the college governance documents.

The curriculum approval process generally consists of a proposal from the department/program level, approved by the department/program curriculum committee (if applicable), college curriculum committee, and the dean. Additional approvals are needed from the Graduate College if the program proposal is a graduate program.

The program proposal is submitted to the Faculty Senate Curriculum committee for review. The Academic Affairs Committee reviews the proposal before passing it onto the Faculty Senate. The Board of Regents, State of Iowa approves all new programs and majors. For additional information about the approval process, see the link to Faculty Senate/ Faculty Handbook Curriculum Approvals – Section 10.8. See the Office of the Provost (<http://www.provost.iastate.edu/>) web site for more information.

Catalog updates are generally processed with approvals from department, college, and Faculty Senate Curriculum Committee (<http://www.facsen.iastate.edu/councils/academicaffairs/curriculum/>) representatives. Editing begins in late February with course changes

due to the Office of the Registrar by June 1. Curriculum and other general information is due to the Office of the Registrar by December 1. Publication is the following February.

See the catalog editing website (<http://www.registrar.iastate.edu/catalog-editing/>) for more details on how to make changes to the catalog.

# ACCREDITATION AND ADMINISTRATION

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## Accreditation

Iowa State University is accredited by the Higher Learning Commission.

### Higher Learning Commission

230 South LaSalle St., Suite 7-500

Chicago, IL 60604-1411

(800) 621-7440; (312) 263-0456

Fax: (312) 263-7462

[info@hlcommission.org](mailto:info@hlcommission.org)

[www.hlcommission.org](http://www.hlcommission.org) (<https://www.hlcommission.org>)

## Board of Regents, State of Iowa

[www.regents.iowa.gov/](http://www.regents.iowa.gov/) (<http://www.regents.iowa.gov/>)

The laws of the United States and of the State of Iowa provide for resident academic instruction, research, and extension education, and for the management of Iowa State University of Science and Technology. The university and two other state educational institutions of higher learning are governed by the Board of Regents, State of Iowa, which is composed of nine members nominated by the Governor of Iowa and confirmed by the Senate of Iowa. The immediate regulation and direction of the academic, research, and extension activities of the university are delegated by the Board of Regents, State of Iowa, to the president and faculty of the university. The board appoints an executive director with overall responsibility for the administration of the central office of the board located in Urbandale, Iowa.

## Officers of Administration

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President of the University

Jonathan A. Wickert, Ph.D.

Senior Vice President and Provost

Shawn Norman, M.B.A.

Senior Vice President for Operations and Finance

Toyia K. Younger, Ph.D.

Senior Vice President for Student Affairs

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Vice President and Chief Information Officer

Kristi Darr, M.B.A.

Vice President of University Human Resources

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Vice President for Extension and Outreach

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Sharon Perry-Fantini Ph.D.

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Dean of the College of Human Sciences

Beate Schmittmann, Ph.D.

Dean of the College of Liberal Arts and Sciences

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Dean of the College of Veterinary Medicine

William R. Graves, Ph.D.

Dean of the Graduate College

Hilary T. Seo, M.S.

Dean of the Library

Dawn Bratsch-Prince, Ph.D.

Associate Provost for Faculty

Ann Marie VanDerZanden, Ph.D.

Associate Provost for Academic Programs

Sharron Evans, J.D.

Associate Vice President for Student Affairs and Dean of Students

# ADMISSIONS

## Office of Admissions

Executive Director of Admissions and New Student Programs

Katharine Johnson Suski

## Admission

### When to Apply

Applicants for the fall semester are encouraged to apply during the fall of the year preceding their entry to Iowa State University. Applications for other terms should be submitted well in advance of the desired entry date.

Application deadlines are available at [www.admissions.iastate.edu](http://www.admissions.iastate.edu). (<http://www.admissions.iastate.edu/>)

Completed applications for admission to the professional curriculum in the College of Veterinary Medicine, together with the required supporting transcripts, must be received by an established deadline. See College of Veterinary Medicine, Application and Admission.

### How to Apply

Applications for admission are available online at [www.admissions.iastate.edu](http://www.admissions.iastate.edu). (<http://www.admissions.iastate.edu/>)

Iowa State University operates on a rolling admissions basis. Admission of applicants for fall semester begins in July of the preceding year. Admission for other terms begins approximately 12 months prior to the beginning of the term. Admission offers are issued for a specific term and are valid only for the term specified.

### Undergraduate Admission Directly from High School

Admission decisions are made by admissions officers in accordance with the entrance requirements as set forth in the Iowa Administrative Code as well as the admission policies established by the Faculty Senate.

Students who seek admission must meet the following requirements and also any special requirements for the college or curriculum of their choice.

Applicants must submit an application for admission and the appropriate application fee (see [www.admissions.iastate.edu](http://www.admissions.iastate.edu) (<http://www.admissions.iastate.edu/>) for current application fee information). In addition applicants must have their secondary school provide an official final transcript of their academic record, including cumulative grade point average and certification of graduation.

Applicants must also arrange to have their ACT or SAT scores reported to Iowa State directly from the testing agency. U.S. citizen and immigrant applicants who will not graduate from an approved U.S. high school and whose primary language is not English must meet university

communication proficiency requirements. This can be accomplished by achieving satisfactory scores on the TOEFL, IELTS, PTE, ACT, or SAT. In addition to these tests, the Duolingo English Test (DET) may be used for undergraduates only. Detailed information concerning test score requirements can be found at <http://www.admissions.iastate.edu/intl> (<http://www.admissions.iastate.edu/intl/>).

Applicants may be required to submit additional information or data to support their applications.

A. Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who achieve a Regent Admission Index (RAI) score of at least 245 will be offered admission. Graduates of approved Iowa high schools who have the subject-matter background required by Iowa State University and who achieve less than a 245 RAI score will be considered for admission on an individual basis.

The RAI score will be calculated for each applicant based upon the mathematical formula listed below:

#### Regent admission Index Formula:

(ACT composite score x 3)

+ (Cumulative GPA x 30)

+ (Number of years of core courses in high school x 5)

= RAI Score

Note: For purposes of calculating the RAI, SAT scores will be ACT composite equivalents; high school GPA is expressed on a 4-point scale; and number of high school courses completed in the core subject areas is expressed in terms of years or fractions of years of study.

Applicants from high schools that do not present all of the factors required for calculation of the RAI score will be considered for admission on an individual basis.

A. Nonresidents of Iowa, including international students, may be held to higher academic standards, but must meet at least the same requirements as resident applicants.

B. Applicants who are graduates of nonapproved high schools will be considered for admission in a manner similar to applicants from approved high schools, but additional emphasis will be given to scores earned on standardized examinations.

C. Applications may be considered from students who did not graduate with their high school classes. They will be required to submit all academic data to the extent that it exists and achieve scores on standardized examinations which will demonstrate that they are adequately prepared for academic study.

D. Students with satisfactory academic records may be admitted, on an individual basis, for part-time university study while enrolled in high school or during the summers prior to high school graduation.

E. Exceptional students may be admitted as full-time students before completing high school. Early admission is provided to serve persons whose academic achievement and personal and intellectual maturity clearly suggest readiness for college-level study.

US freshman applicants are not required to submit ACT or SAT scores to be considered for admission. Applicants who do not provide their test scores will be considered for admission based on an individual review of their academic records with emphasis given to the high school cumulative GPA and core courses.

### High School Preparation

Graduation from an approved high school shall ordinarily precede entrance into Iowa State University.

Students who wish to enter Iowa State University directly from high school (or transfer from another college or university with less than 24 semester hours of graded transferable college credit) must meet the level of academic performance described above and show evidence of the following high school preparation:

#### English/Language Arts

Four years, emphasizing writing, speaking, and reading, as well as an understanding and appreciation of literature

#### Mathematics

Three years, including one year each of algebra, geometry, and advanced algebra

#### Science

Three years, including at least two years of courses which emphasize elements of biology, chemistry, or physics

#### Social Studies

Two years

### Additional Requirements for the College of Liberal Arts and Sciences and the College of Engineering

In addition to the high school preparation requirements described above, students applying to the College of Liberal Arts and Sciences must have completed an additional year of social studies, for a total of three years, and two years of a single foreign language. Students applying to the College of Engineering must have completed two years of a single foreign language.

Students who do not meet the high school course preparation requirements listed here, but who are otherwise well qualified, may be admitted after individual review of their applications.

## Undergraduate Admission - Nondegree Undergraduate

Students who wish to attend Iowa State University to take undergraduate courses but who do not plan to seek an undergraduate degree from Iowa State University should apply as nondegree undergraduate students. Credit taken under the nondegree undergraduate classification is applicable for undergraduate degree purposes for those who are later admitted as degree-seeking undergraduate students. Nondegree undergraduates who have already earned an undergraduate degree may not enroll in graduate credits. To take courses listed as available for graduate credit, a student must enroll as a nondegree graduate and pay graduate fees. Credit obtained under the nondegree undergraduate classification may not be applied toward a graduate degree.

Nondegree applicants are held to the same standards of admission as degree-seeking applicants, including English language proficiency.

## Reentering Students - Undergraduate and Graduate

Reentering undergraduate students are those who have previously attended Iowa State University and are returning after an absence of at least one full year. See Index, Reentry Students.

International students need to reapply after an absence of one full semester, exclusive of summer session. International reentries must also contact the International Students and Scholars office to request the necessary visa application forms.

Reentering graduate students do not need to complete a reentry form but should notify their program and the Office of the Registrar of their intent to reenter Iowa State University. Graduate students returning after 24 months will need to complete the reinstatement process. See Index, Reentry Students.

## Undergraduate Admission by Transfer from Other Educational Institutions

Students who seek admission must meet the following requirements and also any special requirements for the college and curriculum of their choice.

Applicants must submit an application for admission, and the appropriate application fee (see [www.admissions.iastate.edu](http://www.admissions.iastate.edu) (<http://www.admissions.iastate.edu/>) for current application fee information). Applicants must also request that each institution they have attended send an official transcript of record to the Office of Admissions. Failure to provide transcripts from all colleges or universities attended may result in denial of the application or dismissal from the university. If less than 24 semester hours of graded transferable college credit is completed prior to entry at Iowa State University, applicants must also request that their official high school transcript be sent to the Office of Admissions. Students may elect to also have their ACT or SAT scores sent to the Office of Admissions.



U.S. citizen and immigrant applicants who have not graduated from an approved U.S. high school and whose primary language is not English must meet the university's English communication requirement. This can be accomplished by achieving satisfactory scores on the Test of English as a Foreign Language (TOEFL), the International English Language Testing System (IELTS), Duolingo English Test (DET), ACT or SAT. Refer to <https://www.admissions.iastate.edu/intl/transfer> (<https://www.admissions.iastate.edu/intl/transfer/>) for minimum score requirements for each examination.

**A. Transfer applicants with a minimum of 24 semester hours of graded transferable credit from regionally accredited colleges or universities will be admitted provided they have achieved a minimum 2.25 transfer grade point average (on a 4.00 grading scale) for all college work previously attempted. Applicants who have earned an associate's degree will be required to have earned a minimum 2.00 transfer grade point average.**

Some programs may require a transfer grade point average higher than this minimum. Higher academic standards may be required of students who are not residents of Iowa, including international students.

Applicants who have not maintained the grade point average required by Iowa State University for specific programs or who are under academic suspension from the last college attended generally will be denied admission.

**B. In addition to meeting the minimum transfer grade point average requirement described above, applicants who have completed fewer than 24 semester hours of graded transferable college credit prior to their enrollment at Iowa State must also meet the admission requirements for students entering directly from high school.**

**C. Transfer applicants under disciplinary suspension will not be considered for admission until information concerning the reason for the suspension has been received from the college assigning the suspension. Applicants granted admission under these circumstances will be admitted on probation.**

**D. Transfer applicants from colleges and universities not regionally accredited will be considered for admission on an individual basis, taking into account all available academic information.**

### **Transfer Credit Practices**

Iowa State University endorses the Joint Statement on Transfer and Award of Academic Credit approved by the American Council on Education (ACE) and the American Association of Collegiate Registrars and Admissions Officers (AACRAO).

The acceptance and use of transfer credit are subject to limitations in accordance with the educational policies of Iowa State University.

### **A. Students from regionally accredited colleges and universities.**

Credit earned at regionally accredited colleges and universities is acceptable for transfer, except for the following, which may not be accepted, or may be accepted to a limited extent:

—credit in courses determined by Iowa State University to be of a developmental, vocational, or technical nature

—credit in courses or programs in which the institution granting the credit is not directly involved.

No more than 65 semester or 97 quarter credits earned at two-year colleges can be applied to a bachelor's degree from Iowa State University. While there is no limit to the number of credits that may be transferred from a four-year institution, the last 32 semester credits must be completed at Iowa State University.

### **B. Students from colleges and universities which have candidate status.**

Credit earned at colleges and universities which have become candidates for accreditation by a regional association is acceptable for transfer in a manner similar to that from regionally accredited colleges and universities if the credit is applicable to the bachelor's degree at Iowa State University.

Credit earned at the junior and senior classification from an accredited two-year college which has received approval by a regional accrediting association for change to a four-year college may be accepted by Iowa State University.

### **C. Students from colleges and universities not regionally accredited.**

Courses completed at colleges and universities that are not regionally accredited will be evaluated according to the recommendations made by the American Association of Collegiate Registrars and Admissions Offices or the American Council on Education.

In determining the acceptability of transfer credit from colleges which are not regionally accredited, acceptance practices indicated in the current issue of Transfer Credit Practices of Designated Educational Institutions will be used as a guide. For institutions not listed in the publication, guidance is requested from the designated reporting institution of the appropriate state.

### **D. Students from foreign colleges and universities.**

Transfer credit from foreign educational institutions may be granted after a determination of the type of institution involved, its recognition by the educational authorities of the foreign country, and an evaluation of the content, level, and comparability of the study to courses and programs at Iowa State University. Credit may be granted in specific courses or assigned to general areas of study. Extensive use is made of professional journals and references which describe the educational systems and programs of individual countries.



## **Additional Transfer Credit Policies**

### **A. Students with credit obtained during military service.**

Credit will be awarded for successful completion of technical or specialized schools attended while on active duty with the armed forces to the extent that the material is applicable toward degree requirements at Iowa State University. Application for such credit is made at the Office of Admissions, which follows many of the recommendations in the American Council on Education (ACE) publication *The ACE National Guide*.

### **B. Students with credit obtained through non-college sponsored instruction.**

Credit will be awarded for successful completion of learning acquired from participation in formal courses sponsored by associations, business, government, industry, and unions to the extent that the material is applicable toward degree requirements at Iowa State University. Application for such credit is made at the Office of Admissions, which follows many of the recommendations in the American Council on Education (ACE) publication: *The ACE National Guide*.

### **C. Students with credit obtained through correspondence courses.**

Although Iowa State does not offer correspondence courses, college level courses taken by correspondence from accredited colleges or universities are acceptable for transfer at the undergraduate level if the courses taken are those that do not require laboratory study.

### **D. College Level Examination Program (CLEP).**

Iowa State University will award credit for each of the following 15 examinations: Financial Accounting, Principles of Accounting, American Government, Biology, Calculus, French Language, German Language, Humanities, Principles of Macroeconomics, Principles of Microeconomics, Natural Sciences, Introductory Psychology, Social Sciences and History, Introductory Sociology, Spanish Language.

Application of CLEP credit to a degree program varies with the department, so students should consult with their department before they register for CLEP examinations. Additional information is available at [www.admissions.iastate.edu/cbe/](http://www.admissions.iastate.edu/cbe/) ([http://www.admissions.iastate.edu/cbe/cbe\\_clep.php](http://www.admissions.iastate.edu/cbe/cbe_clep.php)).

### **E. Students with "test-out" credit.**

Students who have earned credit at other colleges or universities through Advanced Placement (AP), College Level Examination Program (CLEP), or International Baccalaureate (IB) examinations may qualify for credit at Iowa State University. Scores from these examinations should be sent directly to the Office of Admissions; credit will be awarded provided the scores satisfy Iowa State's requirements.

Credit earned at another college through locally designed test-out examinations may transfer to Iowa State University if accompanied by at least 12 transferable semester credits earned through coursework taken at that institution.

### **F. Credit for prior learning.**

Credit for prior learning applies to learning acquired from, but not limited to, credit by examination (e.g., Advanced Placement Exam (AP), College Level Exam (CLEP), International Baccalaureate (IB), Departmental Exams, etc.), credit that has been recommended by non-degree granting institutions, and ACE-recommend military coursework and/or experience. Credit awarded for prior learning is documented, evaluated, and appropriate for the level of degree awarded. Iowa State University does not award credit for work or life experience nor does it award credit for a service member's military occupational experience.

Iowa State University will allow a maximum of 60 credits of prior learning to satisfy a student's undergraduate degree requirements, of which no more than 32 credits may come from the credit by examination.

## **Articulation/Transfer Agreements**

### **A. Iowa Regent Universities General Education Articulation Agreement.**

Iowa State University participates in an articulation agreement with the other two Iowa Regent universities concerning the acceptance of their general education programs into the Iowa State University College of Liberal Arts and Sciences. Under the terms of this agreement, students who have satisfied general education requirements at the University of Northern Iowa or in the College of Liberal Arts at the University of Iowa may transfer to Iowa State's College of Liberal Arts and Sciences with their general education requirements met (with the possible exception of the foreign language, diversity, and library requirements).

### **B. Associate of Arts (A.A.) Articulation Agreement with Iowa public community colleges.**

Students who plan to enter the College of Liberal Arts and Sciences or the Ivy College of Business at Iowa State University with an associate of arts degree from an Iowa public community college, and who have at least a 2.00 cumulative grade point average, will be considered to have met the general education requirements of that college. Ivy College of Business students will still be required to take an ethics and a global course to satisfy general education requirements unless they are taken as part of the associate of arts degree.

### **C. Associate of Science (A.S.) Articulation Agreement with Iowa public community colleges.**

Students who plan to enter the College of Liberal Arts and Sciences at Iowa State University with an associate of science degree from an Iowa public community college, and who have at least 60 prescribed semester credits acceptable for transfer and at least a 2.00 cumulative grade point average, will be enrolled at junior level status upon entry to Iowa State University, College of Liberal Arts and Sciences. Transfer students with AS degrees will have their transfer credits evaluated course-by-course to determine how the courses will be applied to their intended Iowa State major/degree program requirements.

### **D. Career-technical credit from Iowa public community colleges.**

Iowa State University will accept up to 16 semester (24 quarter) credits earned in career-technical courses where the sending Iowa public

community college will accept such courses toward its associate of arts or associate in science degree. Certain career-technical courses at Iowa community colleges may be articulated to Iowa State University as academic credit. The credit hours earned in these articulated courses would transfer in addition to the 16 semester hour career-technical maximum. Please refer to the course equivalency guides on the Web ([www.admissions.iastate.edu/equiv](http://www.admissions.iastate.edu/equiv) (<https://www.admissions.iastate.edu/equiv/>)) or contact the Office of Admissions for more information.

#### **E. AP and CLEP credit from Iowa public colleges and universities.**

Iowa State University has an agreement with the Iowa public colleges and universities which allows credit earned through AP and CLEP examinations to transfer directly to Iowa State University if accompanied by at least 12 transferable semester credits earned through coursework taken at the sending institution.

#### **On-line Transfer Articulation System (TRANSIT)**

TRANSIT is Iowa State's online system, which displays how credits from a community college or another university may transfer to a degree program at Iowa State. In TRANSIT, prospective or current students can generate a transfer credit evaluation showing how their courses and degrees from a community college or university transfer to Iowa State University. In addition, students can request an unofficial degree audit, which will display how their transfer courses are applied within a particular Iowa State major/degree program. TRANSIT is easy to use and can be accessed by going to <http://transit.iastate.edu>.

#### **Transfer of Credits**

Credits presented from another institution are evaluated initially by the Office of Admissions to determine whether the courses are acceptable for transfer credit. In addition, credits applied toward a particular degree will be determined by the student's college, based on relevance to the students' program requirements as well as the level of performance deemed necessary for successful progress in that program. For example, courses that are deemed important to a program but were earned with less than a C grade may or may not be approved for a program. This policy also applies to students already enrolled at Iowa State University and to new transfer students. Grades earned in courses transferred to Iowa State University will not be used in calculating a transfer student's Iowa State cumulative grade point average.

Students should consult with their academic advisors and the Office of Admissions before taking coursework at other colleges and universities to be certain the credits will transfer and will be applicable to their program of study. Students who believe that any transfer credits have not been correctly evaluated should consult with their academic advisor and with the Office of Admissions. Questions concerning how transfer credits are applied toward a degree program should be referred to the academic advisor and college office.

No more than 65 semester or 97 quarter credits earned at two-year colleges can be applied to a bachelor's degree from Iowa State University. While there is no limit to the number of credits that may be transferred from a four-year institution, the last 32 semester credits before receiving a degree from Iowa State University must be completed at Iowa State University. Credits earned while students participated in an ISU Study Abroad or National Student Exchange program are exempt from this requirement.

Iowa State University students who attend one of the other Iowa Regent universities under the Regent Universities Student Exchange Program will have the credits earned at the other university counted as resident credit and grades received included in their Iowa State University cumulative grade point average, even if the credits are included in the last 32 semester credits. For information on applying to the program see Index, Regent Universities Student Exchange Program (<http://catalog.iastate.edu/azindex/>).

#### **Credit by Examination (CBE)**

It is Iowa State University policy to grant academic credit by examination in many of the undergraduate courses listed in the university bulletin. Credit is awarded primarily in the introductory level classes in mathematics, natural, physical, and social sciences, and the liberal arts. Students with superior high school backgrounds or those with college-level proficiency in certain subject areas are strongly encouraged to investigate and attempt testing in the CBE programs available.

#### **Types of Credit By Examination Programs (CBE)**

Students may earn academic credit in any of six ways and have that credit recorded on their academic record when they enroll. Programs accepted at Iowa State include the Advanced Placement (AP) Program, the International Baccalaureate (IB) Examinations, the Global Assessment Certificate (GAC), Cambridge International AS and A Level Subject examinations, departmental examinations, and the College Level Examination Program (CLEP). Iowa State's policies for awarding credit for each of these programs may be found at [www.admissions.iastate.edu/cbe](http://www.admissions.iastate.edu/cbe) (<http://www.admissions.iastate.edu/cbe/>).

#### **Advanced Placement (AP) Program of the College Board**

This program allows students, while still in high school, to take examinations for credit at the college level. Iowa State University awards credit or advanced placement through the Advanced Placement Program in art, biology, chemistry, computer science, economics, English, environmental science, foreign languages, geography, government and politics, history, mathematics, music, physics, psychology and statistics. High school counselors and teachers will assist with testing arrangements.

Generally, students scoring 3 or better on the exams will be considered for course credit based on departmental review of the exams. In some departments, only scores of 4 or better will be considered for credit.

Detailed information concerning the Advanced Placement Program can be found at <https://apstudent.collegeboard.org/home> (<https://apstudent.collegeboard.org/home/>).

### **International Baccalaureate Examinations**

The International Baccalaureate (IB) Program, offered at many high schools in the United States and abroad, allows students the opportunity to take examinations for credit at the college level. These examinations are offered at standard and higher levels.

Iowa State University awards credit for most higher level examinations and some standard level examinations. Students must receive a minimum score of 4 to qualify for academic credit in most subject areas. Some departments require higher scores. Official IB examination results must be sent directly to the Office of Admissions from the International Baccalaureate Americas Office. Results listed on high school transcripts are not considered official.

Detailed information concerning the IB Program can be found at <http://ibo.org/iba/>. Course equivalencies and minimum scores required by Iowa State can be at <https://www.admissions.iastate.edu/cbe/ib.php>

### **Global Assessment Certificate**

The Global Assessment Certificate (GAC) is a university preparation program that provides students with the academic knowledge, skills, and confidence to thrive in an English-language bachelor's degree program as well as preparation for the ACT university admissions test. Students who complete all three levels of the GAC and provide official confirmation of their completion/graduation by submitting a GAC Academic Transcript can earn university credit for GAC coursework. Details regarding transfer credit for the GAC can be reviewed at <https://www.admissions.iastate.edu/cbe>.

### **Cambridge international AS and A level subjects**

Cambridge Advanced offers college preparatory courses worldwide. At the conclusion of course studies and examinations, an official GCE Certificate must be received in order to award transfer credits. Official AS- and A-Level examination certificates must be sent directly to the Office of Admissions. Results listed on school transcripts are not considered official. Course equivalencies can be found at <https://www.admissions.iastate.edu/cbe>.

### **Departmental Examinations**

Students may take locally constructed departmental examinations for undergraduate credit in specified subject areas for which they and the department feel they have the necessary preparation. These exams are generally administered by the department which offers the course (for exceptions, see CLEP offerings below). Students interested in taking

departmental (or CLEP) examinations should contact the appropriate department for specific information on the course covered by the exam and the exam itself. A nonrefundable fee is charged for each departmental examination requested.

If an acceptable exam score is achieved, a grade of T will be reported to the Office of the Registrar. The T grade represents performance equivalent to a C or better in the course. T grades are not used in computing students' grade point averages; however, the credit does become part of their official academic record and may be applied toward their graduation requirements.

Most examinations for credit are prepared by the departments offering the courses. In some cases, the examination used is part of the College Level Examination Program (CLEP), where the content of the CLEP test has been judged to be an equivalent to the content of the course.

### **College Level Examination Program**

CLEP is available on computer only and Iowa State University only accepts the CLEP tests listed in this section. Up to six semester credit hours in each of these three CLEP general tests is awarded: Social Sciences and History, Humanities, and Natural Sciences. In addition, the College of Engineering does not allow credit earned from CLEP Social Sciences and History, Humanities, and Natural Sciences tests to be used in their students' degree programs.

CLEP tests accepted at Iowa State University include American Government, Financial Accounting (engineering majors should consult with their academic advisor before registering for this examination), Biology (not for biology or engineering majors), Calculus, Introductory Psychology, Introductory Sociology, Principles of Macroeconomics, and Principles of Microeconomics.

In addition, Iowa State University will award up to 9 semester credit hours for CLEP French Language, up to 9 semester credit hours for CLEP German Language, and up to 9 semester credit hours for CLEP Spanish Language.

For more information on required scores and credit that will be awarded, please refer to the Credit by Exam website [www.admissions.iastate.edu/cbe](http://www.admissions.iastate.edu/cbe) (<https://www.admissions.iastate.edu/cbe/>).

Information about testing centers and registration can be found at <https://clep.collegeboard.org/search/test-centers> (<https://clep.collegeboard.org/search/test-centers/>). For information on whether to take any of the CLEP tests, contact your academic advisor. Additional information on the CLEP exam is available at <https://clep.collegeboard.org/>.

### **Policies and Procedures Governing CBE Tests**

1. Departmental and CLEP tests are offered to newly admitted or currently enrolled students at Iowa State University. Former and future students

will receive credit only if they enroll sometime during the twelve months immediately following the test(s).

2. Permission to take a departmental examination is obtained from the department. Students may be denied permission because (a) the nature of the course is such that proficiency cannot be measured by such a test, (b) the student does not appear to have adequate background to pass the examination for the course, or (c) the student would not otherwise be allowed to enroll in the course. Students may appeal such a denial to the dean of the college in which the department is administered and subsequently to the provost.

3. Students may ordinarily attempt a CBE test only once in any course or area. Under special circumstances a retest may be taken upon approval of the department in which the course is offered.

4. Credit by examination will not be granted if it duplicates courses previously passed or failed.

5. Departmental examinations and CLEP subject tests cover only a single course and students may not test out of independent study or special topic courses.

6. There is a nonrefundable fee for all departmental tests. The fee is set by the Board of Regents, State of Iowa, and is subject to change.

7. Departmental examinations are usually given just prior to, or within two weeks of, the beginning of fall and spring semesters. For more information, students should contact the department that offers the class. CLEP tests are given throughout the year.

8. Credit for the CLEP examinations Social Sciences and History, Humanities, and Natural Sciences is not evaluated as equivalent to any specific course and cannot be used in place of specific course requirements for the major. All colleges (except Engineering, which does not accept these tests) allow these CLEP credits to be used for either general requirements (not in Liberal Arts and Sciences) or elective credit. Students are responsible for checking with their academic advisors to determine whether such credit is to their benefit.

9. Listed below are policies for transferring CBE from another college or university to Iowa State University:

a. AP or CLEP credit which is earned at an Iowa public college or university may be transferred directly to Iowa State University provided it is accompanied by at least 12 semester credits earned in residence at the sending institution. AP or CLEP credit which is earned at any other college or university may not be transferred directly to Iowa State. However, the scores from these examinations may be sent to Iowa State University from the testing agency, and credit will be awarded based on Iowa State's AP and CLEP policies.

b. IB credit earned at another college or university may not be transferred directly to Iowa State University. However, the scores from IB examinations may be sent to Iowa State from the testing agency, and credit will be awarded based on Iowa State's IB policies.

c. Credit earned at another college or university through local test-out examinations may be transferred directly to Iowa State University provided it is accompanied by at least 12 semester credits earned in residence at the sending institution.

d. Credit earned at another college or university for GAC or Cambridge Advanced exams may not be transferred directly to Iowa State University. However, the official GAC Academic Transcript or officially certified copies of GCE AS or A Level examination certificates may be submitted directly to Iowa State University from the respective testing authority, and credit will be awarded based on Iowa State's policies.

10. Credit earned from CBE will be posted to the student's academic record at the end of the term. CBE credits will be counted toward the projected year in school classification used to establish registration start dates.

11. Some professional programs do not accept T (test-out) credit in preprofessional courses. Students who anticipate applying to such programs should inquire about the acceptability of such credit before registering for such CBE tests.

12. Credit established at Iowa State University will usually transfer to other colleges and universities; however, the final decision rests with the institution reviewing the transcript.

Below is detailed information concerning Iowa State University admission policies and procedures. Prospective students are also encouraged to visit the following websites for additional information:

Office of Admissions: [www.admissions.iastate.edu](http://www.admissions.iastate.edu) (<http://www.admissions.iastate.edu/>)

Apply: [www.admissions.iastate.edu/apply/online/](http://www.admissions.iastate.edu/apply/online/) (<https://www.admissions.iastate.edu/apply/online/>)

Visits to Campus: <http://www.admissions.iastate.edu/visit/index.php> (<http://www.admissions.iastate.edu/visit/>)

Freshman Admissions: [www.admissions.iastate.edu/freshman/](http://www.admissions.iastate.edu/freshman/) (<https://www.admissions.iastate.edu/freshman/>)

Transfer Admissions: <https://www.admissions.iastate.edu/transfer/>  
International Admissions: [www.admissions.iastate.edu/intl/](http://www.admissions.iastate.edu/intl/) (<http://www.admissions.iastate.edu/intl/>)

Graduate Admissions: [www.admissions.iastate.edu/graduate/](http://www.admissions.iastate.edu/graduate/) (<http://www.admissions.iastate.edu/graduate/>)

Veterinary Medicine Admissions: [www.vetmed.iastate.edu/students/future-dvm-students](http://www.vetmed.iastate.edu/students/future-dvm-students) (<http://www.vetmed.iastate.edu/students/future-dvm-students/>)

Orientation: [www.admissions.iastate.edu/orientation](http://www.admissions.iastate.edu/orientation) (<https://www.admissions.iastate.edu/orientation/>)

Destination Iowa State: <https://www.admissions.iastate.edu/destination/index.php> (<https://www.admissions.iastate.edu/destination/>)

Admissions Partnership Program: [www.admissions.iastate.edu/partnership/](http://www.admissions.iastate.edu/partnership/) (<http://www.admissions.iastate.edu/partnership/>)

On-line Transfer Articulation System (TRANSIT): [www.transit.iastate.edu/](http://www.transit.iastate.edu/) (<https://transit.iastate.edu/>)

Credit by Exam (CLEP, AP, IB): [www.admissions.iastate.edu/cbe/](http://www.admissions.iastate.edu/cbe/) (<https://www.admissions.iastate.edu/cbe/>)

Veterans and Military Students: [www.admissions.iastate.edu/military/](http://www.admissions.iastate.edu/military/) (<https://www.admissions.iastate.edu/military/>)

## Student Housing and Dining Department of Residence (DOR)

Welcome to your Cyclone Home! The university provides housing for almost 9,000 students in university owned on-campus residence halls and apartments.

- Single (non-family) student housing is available in all residence halls and the Frederiksen Court and University Village apartment communities.
- Family housing is available to students and their partners, children, and other relatives in the Schilleter Village apartments.

While newly-admitted freshmen 18 and under are assigned to the halls, all halls and apartments have a diverse mix of freshmen, sophomores, juniors, seniors, and graduate students making on-campus housing a great place to live and learn. Visit <http://housing.iastate.edu/> for details.

## ISU Dining

With 26 locations, a fresh meal or snack is right around the corner! We offer flexible meal plans for students living both on and off-campus. Our dining centers serve a wide variety of fresh-made items and are a great place for a sit-down meal. Locations like our cafes, restaurants and markets are perfect for coffee breaks, meals and snacks when you're on the go. Our culinary team is ready to serve you!

If you're living in Birch-Welch-Roberts, Barton-Lyon-Freeman, Maple, Willow, Larch, Geoffroy, Buchanan, Eaton, Martin, Helser or Friley Halls, you can choose any of the following plans! A quick explanation of each plan is below and you can learn even more on our website. (<https://www.dining.iastate.edu/meal-plans/residence-halls/>)

- **Cardinal and Cyclone Plans:** These are anytime plans, you never have to worry about counting meals! Just pop into a dining center

whenever you'd like. The convenience and flexibility of these plans are perfect for a busy student's lifestyle. We even added more dining dollars to our Cardinal plan for a total of \$100 dining dollars per semester for all your snacks!

- **Gold Plan:** This is a declining meal balance plan. You have 200 meals of dining center meals each semester you need to keep track of.
- **CyFlex:** This is our hybrid plan and combines the functionality of the other two types of plans above.

Each plan also gives you a set number of Dining Dollars (<https://www.dining.iastate.edu/meal-plans/flex-meals-dining-dollars-explained-2/>) and Flex Meals (<https://www.dining.iastate.edu/meal-plans/flex-meals-dining-dollars-explained-2/>). Plus, you have access to GET & Go (<https://www.dining.iastate.edu/meal-plans/flex-meals-dining-dollars-explained-2/>) meals.

- **Dining Dollars:** These spend dollar-for-dollar and are intended for things like snacks and convenience items.
- **Flex Meals:** Use these at any campus location when you want a full meal - they're perfect for restaurants and you can even use them to get a friend into a dining center.
- **GET & Go:** These locations are on the east and west sides of campus (UDCC and Conversations). You'll get a hot entree, two sides and a drink. This service uses one of your dining center swipes and you can use these locations up to 10 times per week. It doesn't use a Flex Meal or Dining Dollars.

Are you a Frederiksen Court or SUV resident? You can choose from the plans above or from the apartment plans that are located here (<https://www.dining.iastate.edu/meal-plans/apartmentsoff-campus/>)

Questions about choosing a plan? Email us at [dining@iastate.edu](mailto:dining@iastate.edu)



# TUITION, FEES, AND EXPENSES

## Tuition And Fees

Tuition and fees are based on the number of credits in which a student is enrolled as of 5:00 p.m. on the 10th day of class. Maximum charges start at 12 credits for undergraduate and veterinary medicine students. Maximum charges start at 9 credits for graduate students.

Students who are not residents of Iowa pay a higher tuition rate each semester. Nondegree undergraduate students and noncollegiate students pay the same fees as undergraduates. Tuition and fees are assessed in accordance with regulations of the Board of Regents, State of Iowa. Information about these regulations are found in this catalog under Admissions and Registrar.

All tuition, fees, expenses, and policies are subject to change without notice by Iowa State University and the Board of Regents, State of Iowa. For the most current and complete information see <http://www.registrar.iastate.edu/fees/>

## Residency Classification for Admission and Tuition Purposes

These criteria are contained in the Policy Manual, Board of Regents, State of Iowa and or the Iowa Administrative Code: Board of Regents, State of Iowa. For additional information regarding the administrative code addressing residency classification: Section 681–1.4 "Classification of residents and nonresidents for admission, tuition, and fee purposes" <https://www.legis.iowa.gov/docs/aco/chapter/681.1.pdf> (Chapter 1, pg. 4).

### GENERAL INFORMATION

A. A person enrolling at one of the three state universities shall be classified as a resident or nonresident for admission, tuition, and fee purposes by the registrar or someone designated by the registrar. The decision shall be based upon information furnished by the student and other relevant information.

B. In determining resident or nonresident classification, the issue is essentially one of why the person is in the state of Iowa. If the person is in the state primarily for educational purposes, that person will be considered a nonresident. For example, it may be possible that an individual could qualify as a resident of Iowa for such purposes as voting, or holding an Iowa driver's license, and not meet the residency requirements as established by the Board of Regents, State of Iowa, for admission, tuition, and fee purposes.

C. The registrar, or designated person, is authorized to require written documents, affidavits, verifications, or other evidence deemed necessary

to determine why a student is in Iowa. The burden of establishing that a student is in Iowa for other than educational purposes is upon the student. A student may be required to file any or all of the following:

1. A statement from the student describing employment and expected source of support
2. A statement from the student's employer
3. A statement from the student's parents verifying nonsupport and the fact that the student was not listed as a dependent on tax returns for the past year and will not be so listed in future years
4. A statement from the student's spouse related to sources of family support, length of residence in Iowa, and reasons for being in the state of Iowa
5. Supporting statements from persons who might be familiar with the family situation
6. Iowa state income tax return.

D. Applications for resident classification for a given semester or session are due no later than the fifteenth class day of that semester or session. Applications received after the fifteenth class day of that semester or session will be considered for the next semester or session. Appeals of any nonresident classification decision resulting from applications for resident classifications are due no later than midterm of that semester or session. Change of classification from nonresident to resident will not be made retroactive beyond the term in which application for resident classification is made.

E. A student who gives incorrect or misleading information to evade payment of nonresident fees shall be subject to serious disciplinary action and must also pay the nonresident fees for each term previously attended.

F. Review committee. These regulations shall be administered by the registrar or someone designated by the registrar. The decision of the registrar or designated person may be appealed to a university review committee. The finding of the review committee may be appealed to the Board of Regents, State of Iowa.

## GRADUATE ASSISTANTS

Graduate students appointed to a graduate assistantship appointment of 1/4-time or more for at least 3 months in fall and spring terms and for 4 weeks in summer term, are assessed tuition at the full-time resident (in-state) rate for the fall and spring term. Nonresident students with graduate assistantships of 1/4-time or more retain their nonresidency classification, but are assessed resident tuition and fees as long as the graduate assistantship is continued.

The spouse of a 1/4-time or more graduate assistant who is a nonresident is eligible for resident tuition and fees during the period of the assistantship appointment. Iowa residency is not granted, but a waiver of nonresident tuition and fees is in effect. When the graduate assistantship ends, the tuition and fee waiver for the spouse is terminated. (Board of Regents, State of Iowa, Minutes March 15, 1995, p. 801).

The graduate student must request the resident tuition assessment by midterm of the term in question. The benefit will not be granted retroactively.

## GUIDELINES

The following guidelines are used in determining the resident classification of a student for admission, tuition, and fee purposes:

1. A financially dependent student whose parents move from Iowa after the student is enrolled remains a resident provided the student maintains continuous enrollment. A financially dependent student whose parents move from Iowa during the senior year of high school will be considered a resident provided the student has not established domicile in another state.

2. In deciding why a person is in the state of Iowa, the person's domicile will be considered. A person who comes to Iowa from another state and enrolls in any institution of postsecondary education for a full program or substantially a full program shall be presumed to have come to Iowa primarily for educational reasons rather than to establish a domicile in Iowa.

3. A student who was a former resident of Iowa may continue to be considered a resident provided absence from the state was for a period of less than 12 months and provided domicile is reestablished. If the absence from the state is for a period exceeding 12 months, a student may be considered a resident if evidence can be presented showing that the student has long-term ties to Iowa and reestablishes an Iowa domicile. A person or the dependent of a person whose domicile is permanently established in Iowa, who has been classified as a resident for admission, tuition, and fee purposes, may continue to be classified as a resident so long as domicile is maintained, even though circumstances may require extended absence of the person from the state. It is required that a person who claims Iowa domicile while living in another state or country will provide proof of the continual domicile as evidence that the person:

- (1). Has not acquired domicile in another state;
- (2). Has maintained a continuous voting record in Iowa; and
- (3). Has filed regular Iowa resident income tax returns during absence from the state.

4. A student who moves to Iowa may be eligible for resident classification at the next registration following 12 consecutive months in the state provided the student is not enrolled as more than a half-time student (6 credits for an undergraduate or professional student, 5 credits for a graduate student) in any academic year term, is not enrolled for more than 4 credits in a summer term for any classification, and provides sufficient evidence of the establishment of an Iowa domicile.

5. A student who has been a continuous student and whose parents move to Iowa may become a resident at the beginning of the next term provided the student is dependent upon the parents for a majority of financial assistance.

6. A person who has been certified as a refugee or granted asylum by the appropriate agency of the United States, who enrolls as a student at a university governed by the Board of Regents, State of Iowa, may be accorded immediate resident status for admission, tuition, and fee purposes where the person:

- (1). Comes directly to the state of Iowa from a refugee facility or port of debarkation, or
- (2). Comes to the state of Iowa within a reasonable time and has not established domicile in another state.

Any refugee or individual granted asylum not meeting these standards will be presumed to be a nonresident for admission, tuition, and fee purposes and thus subject to the usual method of proof of establishment of Iowa residency.

7. An alien who has immigrant status establishes Iowa residency in the same manner as a United States citizen.

8. At the Regent institutions, American Indians who have origins in any of the original people of North America and who maintain a cultural identification through tribal affiliation or community recognition with one or more of the tribes or nations connected historically with the present state of Iowa, including the Iowa, Kickapoo, Menominee, Miami, Missouri, Ojibwa (Chippewa), Omaha, Otoe (Otto), Ottawa (Odawa), Potawatomi, Sac and Fox (Sauk, Meskwaki), Sioux, and Winnebago (HoCak/Ho-Chunk), will be assessed Iowa resident tuition and fees. (Board of Regents, State of Iowa, Minutes October 15-16, 1997, p. 299)

\*\*Section B below is under revision. For current information, go to <https://www.registrar.iastate.edu/students/in-state-tuition-benefit> (<https://www.registrar.iastate.edu/students/in-state-tuition-benefit/>).

B. Additional guidelines are used in determining the resident classification of a veteran, qualified military person, and dependent children and spouses of a veteran or qualified military person for purposes of admission and undergraduate tuition and mandatory fees:

1. A person who is stationed on active duty at the Rock Island arsenal as a result of military orders, or the dependent child or spouse of such person, is entitled to resident status for purposes of undergraduate tuition and mandatory fees. However, if the arrival of the person under orders is subsequent to the beginning of the term in which the dependent child or spouse is first enrolled, nonresident fees will be charged in all cases for the dependent child or spouse until the beginning of the next term in which the dependent child or spouse is enrolled. If the qualified military person is transferred, deployed, or restationed while the person's spouse or dependent child is enrolled in an institution of higher education under the control of the board of regents, the spouse or dependent child shall continue to be classified as a resident under this subparagraph until the close of the fiscal year in which the spouse or dependent child is enrolled.

2. A veteran who is domiciled or moves to the state of Iowa and who is eligible for benefits, or has exhausted benefits under the federal Post-9/11 Veterans Educational Assistance Act of 2008, is entitled to resident status for purposes of undergraduate tuition and mandatory fees. The dependent child or spouse of a veteran who meets these requirements is entitled to resident status for undergraduate tuition.

However, if the arrival of the veteran in Iowa is subsequent to the beginning of the term in which the dependent child or spouse is first enrolled, nonresident fees will be charged in all cases for the dependent child or spouse until the beginning of the next term in which the dependent child or spouse is enrolled.

3. A person who is moved into the state as the result of military or civil orders from the government for other than educational purposes, or the dependent child or spouse of such a person, is entitled to resident status. However, if the arrival of the person under orders is subsequent to the beginning of the term in which the dependent child or spouse is first enrolled, nonresident fees will be charged in all cases until the beginning of the next term in which the dependent child or spouse is enrolled. Legislation, effective July 1, 1977, requires that military personnel who claim residency in Iowa (home of record) will be required to file Iowa resident income tax returns.

## FACTS

A. The following circumstances, although not necessarily conclusive, have probative value in support of a claim for resident classification:

1. Reside in Iowa for 12 consecutive months, and be primarily engaged in activities other than those of a full-time student, immediately prior to the beginning of the term for which resident classification is sought.
2. Reliance upon Iowa resources for financial support.
3. Domicile in Iowa of persons legally responsible for the student.

4. Former domicile in the state and maintenance of significant connections therein while absent.
5. Acceptance of an offer of permanent employment in Iowa.
6. Military orders, if for other than educational purposes.
7. Other facts indicating the student's domicile will be considered by the universities in classifying the student.

B. The following circumstances, standing alone, do not constitute sufficient evidence of domicile to affect classification of a student as a resident under these regulations:

1. Voting or registration for voting.
2. Employment in any position normally filled by a student.
3. The lease of living quarters.
4. Admission to a licensed practicing profession in Iowa.
5. Automobile registration.
6. Public records; for example, birth and marriage records, Iowa driver's license.
7. Continuous presence in Iowa during periods when not enrolled in school.
8. Ownership of property in Iowa, or the payment of Iowa taxes.

## Fee Payment

The Accounts Receivable Office bills students for tuition, room, meal plan, and various other university charges. A statement of new charges is available on the first of each month on Access Plus and each student will receive an email message at that time at their Iowa State e-mail address telling them that their bill is available. It is the student's responsibility to ensure that the university has a correct e-mail address and to regularly check their Iowa State e-mail account. Students who do not receive a billing statement before the term begins or are unable to use AccessPlus to view their bill, should contact the Accounts Receivable Office to learn the amount of their account balance due. Failure to receive a billing statement or view their account on AccessPlus will not exempt students from late penalties or from having a hold placed on their registration. Payments for fall semester are due August 20. Payments for spring semester are due January 20. Payments for summer semester are due May 20.

Students may pay their university bill by direct debit through AccessPlus. They may also pay by mail by sending a check or money order (along with the bottom portion of the billing statement printed from AccessPlus) to Iowa State University, Treasurer's Office, 1220 Beardshear Hall, 515 Morrill Road, Ames, IA 50011-2103. Payments may also be made in person by taking the personal check or certified funds to the drop box that is located behind the Student Answer Center on the ground floor of Beardshear Hall.



Credit Type - Audits and zero credit courses: Assessed according to contact hours; maximum charge for zero credit courses is three credit hours.

Credit Type - Partial credits: (.5) assessed on the next larger whole number of credits, e.g., 6.5 credits is assessed as 7 credits.

Credit Type - R credit: Assessed for the minimum fee only if no other credits are taken.

Deferred Billing Plan (payment over three months): This \$20 administrative charge (fall, spring, and summer) is assessed to those students who do not pay their full tuition, room and board charges on or before August 20 for fall semester, January 20 for spring semester, and May 20 for summer session. This permits students to spread payment over three installments. The administrative fee helps defray the extra IT and mailing costs involved in carrying and billing the charges over a longer period of time, as well as the extra personnel required in the Treasurer's Office to handle the traffic involved with three tuition payments per semester instead of one.

Iowa State University offers a deferment option for employees of businesses and organizations that provide tuition reimbursement programs. To enroll in the Employer Reimbursement Deferment Plan, please complete our online form found on AccessPlus in the following location: AccessPlus>Student tab>Account/U-Bill>**Empl Reimb Defer**. With successful enrollment in the deferment plan prior to each semester, all applicable charges will be due 30 days after grades are presented.

A non-deferrable \$35 enrollment fee will be assessed to the student U-Bill after successful enrollment into the deferment plan. Students will be responsible for payment of any non-deferred charges on their U-Bill in accordance with statement due dates.

Iowa State University employees will need to submit a tuition reimbursement request prior to the posted deadline, via AccessPlus>Employee tab>Tuition Reimburse, and obtain approval through University Human Resources. For additional information about eligibility requirements and semester application periods for the Tuition Reimbursement Program, please visit University Human Resources' website (<https://www.hr.iastate.edu/benefits/addlbenefits/>).

For more information about the Employer Reimbursement Deferment Plan, contact Holly Hohanshelt in the Accounts Receivable Office at (515) 294-4786 or [hho@iastate.edu](mailto:hho@iastate.edu).

Installment Payment Plan: This administrative charge is assessed to those who elect the Iowa State University Installment Plan. This plan will allow students to pay tuition, room, board, fees, and accounts receivable costs in twelve equal monthly installments. The \$50 annual application fee will defray the extra IT and mailing costs associated with carrying the

charges over a longer period of time, as well as the bank fees associated with the direct debit of payments.

Past Due Accounts: If students have past due accounts receivable charges prior to the beginning of classes, they may be dropped from enrollment if these past due charges are not paid by the Friday before the first day of class. Students that are subject to being dropped will be notified via their Iowa State e-mail account.

Refunds: Refunds are available for students who cancel or withdraw their registration within the appropriate time period. To cancel their registration, students must notify the Office of the Registrar before the first day of the semester to avoid tuition assessment. Beginning on the first day of the semester, it will be necessary for students to formally withdraw from the university to terminate their registration. More information about canceling registration and withdrawing from classes can be found at <http://www.registrar.iastate.edu/registration/responsibilities.shtml>. (<http://www.registrar.iastate.edu/registration/responsibilities.shtml/>)

Tuition adjustments for all students are made for withdrawals of registration according to the following schedule:

#### Withdrawal Date/Student Pays

Before first day of classes: 0%  
 During class days 1-5: 10%  
 During class days 6-10: 25%  
 During class days 11-15: 50%  
 During class days 16-20: 75%  
 After the twentieth day of classes: 100%

Students who wish to appeal tuition and fee assessment for withdrawals should contact the Scheduling & Fees area of the Office of the Registrar. Decisions of the Office of the Registrar will be based on the existence of extenuating circumstances beyond the control of the student.

Students who wish to appeal the decision of the Office of the Registrar must do so in writing within 10 calendar days after receiving the decision. Such appeals will then be reviewed by the Tuition Appeals Review Committee. Students who wish to appeal the decision of the Tuition Appeals Review Committee may make a request to do so in writing to the Office of the Provost.

Fee refund for students with a reduction in credits below full-time: 100 percent if change is made through the 10th day of classes. No adjustment is made after the 10th day of classes. Prorated adjustments in the tuition adjustment schedule are made for summer session courses, or any courses which are less than one semester in length (79 days).

Workshop and Short Courses Refunds: Students who drop workshops or short courses of one or two weeks on or before the first class meeting

receive a 100% tuition adjustment for the course. No tuition adjustment will be made after the first day of classes. Students who drop three-week courses receive a 100% adjustment if they drop on or before the first day of classes, a 90% adjustment if they drop on the second day of classes, and no adjustment after the second day of classes.

## **Veterans and Eligible Dependents Receiving Educational Assistance**

In accordance with the requirements of the Servicemembers Improved Transition through Reforms for Ensuring Progress Act (SIT-REP Act, December 31, 2018), the University will not impose any late fee, deny access to classes or facilities, or assess any other penalty to a Veteran or eligible dependent due to a late payment from the Veterans Administration (VA).

This policy is only applicable to Veterans or eligible dependents who are receiving educational assistance under Chapters 31 (VR&E) or 33 (Post 9/11 and Fry Scholarship) of title 38, United States Code (U.S.C.). In accordance with the SIT-REP Act, students receiving VA educational benefits from Chapter 31 or 33 must provide a certification of eligibility for entitlement of educational assistance to the Office of the Registrar. Nothing in this policy precludes the University from assessing a late fee, denial of access, or any other penalty in relation to payments due the University that are not covered under the SIT-REP Act.

For purposes of this policy, the following terms will be defined as:

- **Late Fee:** A financial penalty, equal to 1% of the outstanding balance, charged to discourage late payment of university bills.
- **Denial of Access:** To prohibit entry, participation, or attendance to an event or facility otherwise afforded to all registered students.
- **Any Other Penalty:** Any other fee, prohibition, or assessment levied upon a student for failure to pay required tuition and fees.

## **Student Financial Aid**

The Office of Student Financial Aid helps families afford Iowa State University. Scholarships, grants, loans, and part-time employment opportunities are available to assist students and families in meeting college expenses. For more information see:

<http://www.financialaid.iastate.edu>

# STUDENT SERVICES

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## Dean of Students Office

[www.dso.iastate.edu](http://www.dso.iastate.edu) (<http://www.dso.iastate.edu>)  
1010 Student Services Building  
(515) 294-1020

The Dean of Students Office (DSO) at Iowa State University uses an integrated approach to support student-centered learning through personal, community and academic development culminating in a transformative experience. Reporting through the Division of Student Affairs, the DSO provides numerous opportunities for students to engage in learning beyond the classroom. The thirteen departments and two programs that comprise the DSO collaborate to create and support a common community experience for Iowa State University students. Our common goal across all areas within the DSO is to support student success.

### *Helping Cyclones Succeed*

Sharron Evans # Associate Vice President for Student Affairs and Dean of Students

For more information see the individual DSO department websites.

## Academic Success Center

[www.asc.dso.iastate.edu](http://www.asc.dso.iastate.edu) (<http://www.asc.dso.iastate.edu>)  
2157 Hixson-Lied Student Success Center  
(515) 294-6624

## Center for LGBTQIA + Student Success

[www.center.dso.iastate.edu](http://www.center.dso.iastate.edu) (<http://www.lgbtss.dso.iastate.edu>)  
4600 Memorial Union  
(515) 294-5433

## Hixson Opportunity Awards

[www.hixson.dso.iastate.edu](http://www.hixson.dso.iastate.edu) (<http://www.hixson.dso.iastate.edu>)  
1080 Hixson-Lied Student Success Center  
(515) 294-6479

## International Students and Scholars Office

[www.isso.iastate.edu](https://www.isso.iastate.edu) (<https://www.isso.iastate.edu>)  
4530 Memorial Union  
(515) 294-1120

## Margaret Sloss Center for Women and Gender Equity

[www.sloss.dso.iastate.edu](https://sloss.dso.iastate.edu) (<https://sloss.dso.iastate.edu>)  
205 Sloss House

(515) 294-4154

## Military-Affiliated Student Center

[www.masc.dso.iastate.edu](https://masc.dso.iastate.edu) (<https://masc.dso.iastate.edu>)  
5600 Memorial Union  
(515) 294-9801

## Multicultural Student Affairs

[www.multicultural.dso.iastate.edu](http://www.multicultural.dso.iastate.edu) (<http://www.multicultural.dso.iastate.edu>)  
2080 Student Services Building  
(515) 294-6338

## National Student Exchange

[www.nse.dso.iastate.edu](http://www.nse.dso.iastate.edu) (<http://www.nse.dso.iastate.edu>)  
1080 Hixson-Lied Student Success Center  
(515) 294-6479

## Parent and Family Programs

[www.parents.dso.iastate.edu](https://www.parents.dso.iastate.edu) (<https://www.parents.dso.iastate.edu>)  
1010 Student Services Building  
(515) 294-1020

## Sorority and Fraternity Engagement

[www.greek.iastate.edu](http://www.greek.iastate.edu) (<http://www.greek.iastate.edu>)  
0355 Memorial Union  
(515) 294-1023

## Student Accessibility Services

[www.sas.dso.iastate.edu](http://www.sas.dso.iastate.edu) (<http://www.sdr.dso.iastate.edu>)  
1060 Hixson-Lied Student Success Center  
(515) 294-7220

## Student Assistance

[www.studentassistance.dso.iastate.edu](http://www.studentassistance.dso.iastate.edu) (<http://www.studentassistance.dso.iastate.edu>)  
1010 Student Services Building  
(515) 294-1020

## Student Conduct

[www.studentconduct.dso.iastate.edu](http://www.studentconduct.dso.iastate.edu) (<http://www.studentconduct.dso.iastate.edu>)  
1010 Student Services Building  
(515) 294-1020

## Student Legal Services

[www.studentlegal.dso.iastate.edu](http://www.studentlegal.dso.iastate.edu) (<http://www.studentlegal.dso.iastate.edu>)  
6660 Memorial Union

(515) 294-0978

## Student Support Services Program

[www.trio.iastate.edu/student-support-services/](http://www.trio.iastate.edu/student-support-services/) (<https://trio.iastate.edu/student-support-services/>)

2010 Student Services Building

(515) 294-0210

## Student Counseling Service

Director of Student Counseling Services: Dr. Kristen Sievert

The Student Counseling Service (SCS) assists students in enhancing their academic success and personal well-being with a staff of professional psychologists and counselors. Services are available to help students sort through their feelings, strengths, and options to develop new perspectives and coping skills.

Services include:

- One-on-one counseling for any issue of personal concern, such as depression, anxiety, stress management, relationship issues, identity issues, and other forms of personal challenge. Students may also receive therapeutic services to deal with more severe mental health issues.
- Couples counseling for ISU students and their partners during times of relationship difficulty.
- Eating disorders assessment and treatment for students concerned with eating or body image issues. Students receiving treatment for eating disorders might also work with physicians, nutritionists, and personal trainers as their needs require.
- Substance abuse assessments to help students determine the nature and extent of their alcohol or other drug use and the impact of this use on their well being. Counselors offer recommendations and referrals for any concerns identified through the assessment.
- Career counseling to assist students having difficulty choosing a major or making decisions about their future after college.
- Group counseling is offered to facilitate personal growth and social skills learning. A list of the current semester's groups is available on the SCS web site.
- A variety of outreach programs are also available.

Counseling services are offered at no cost to ISU students. However, a nominal fee for testing may be required. Nominal fees are also charged for uncanceled missed appointments. Counseling is strictly confidential. SCS staff will not release any information to anyone outside of the

Student Counseling Service without the written permission of the client unless an imminent harm condition exists.

In addition to providing counseling and outreach services to students, SCS provides training and consultation to faculty and staff to assist them in addressing the psychological needs of students.

SCS hours are Monday through Friday 8 a.m. - 5 p.m. The Student Counseling Service phone number is 515-294-5056.

## Thielen Student Health Center

Thielen Student Health Center is a full-service medical clinic in Ames, Iowa, that specializes in students. The clinic is staffed with physicians, advanced registered nurse practitioners and nurses. The medical team is available to care for your primary health care needs.

The clinic offers a full range of medical services including illness and injury care, women's health, allergy and travel care, immunizations, mental health care, laboratory and x-ray services, physical therapy and a full-service pharmacy. After hour service is available for urgent or emergency problems at McFarland Urgent Care Clinic or Mary Greeley Medical Center Emergency Room.

The Prevention Services department provides campus-wide leadership for a comprehensive approach to reduce health risks for students. In collaboration with our campus and community partners, they strive to foster a healthy campus environment and support the academic success of our students. Areas of focus include high-risk drinking and sexual and interpersonal violence.

The mission of the Thielen Student Health Center is to promote the optimal health of our university community by providing high quality, accessible, affordable and accountable health care that encompasses prevention, wellness and education and to support the academic success of the Iowa State University students while building healthy habits for a lifetime.

We provide an inclusive, non-judgmental environment for our diverse student body and are conveniently located on the corner of Sheldon Avenue and Union Drive, right across from State Gym.

Student Health receives no funding from the state of Iowa and relies on the health fee for approximately 50% of its operating budget. Please note that the health fee is not health insurance. All students are encouraged to maintain adequate health insurance coverage while enrolled at Iowa State University. Those taking 4 or fewer credits may still access services by paying the health fee. Spouses/domestic partners of students who opt to pay the health fee also have access to services.

Clinic hours:

Monday, 8 a.m.-6 p.m.; Tuesday, Thursday and Friday, 8 a.m.-5 p.m.; Wednesday, 9 a.m.-5 p.m.; Saturday, 9 a.m.-12 noon. Hours vary during breaks and summer session. Patients are seen by appointment. Please call 515-294-5801.

## The University Library

<http://www.lib.iastate.edu/>

Dean of the Library Services: Hilary Seo

General Information (515) 294-3642

The University Library provides extensive research collections, services and information literacy instruction/information for all students. Facilities consist of the main Parks Library, the Veterinary Medical Library, Design Reading Room, and a remote library storage building.

The library's extensive collections include electronic and print resources that support research and study for all undergraduate and graduate programs. Nationally recognized collections support the basic and applied fields of biological and physical sciences. Library holdings include more than 2,858,448 volumes and approximately 121,125 current serial titles. The library has access to 447,689 electronic books.

The library's instruction program includes an undergraduate information literacy course as well as a wide variety of subject-based seminars on effective use of library resources for undergraduate and graduate students.

The library website provides access to local and web-based resources including electronic journals and books, local collections, online indexes, electronic course reserves and guides, and a broad range of subject research guides. Assistance in using this vast body of electronic resources is available at the Help Desk on the first floor, on the library website through the Ask Us! link, and through individually arranged appointments with librarian liaisons. The Digital Repository @ Iowa State provides free, public access to the research and scholarship of Iowa State's faculty, students and staff.

A limited number of semiprivate study rooms available for graduate students, intended for research and other scholarly activities that require extensive use of library material, are available. Parks Library has group study rooms, multi-media production studios, a presentation room and collaborative multi-media study areas. The library has over 232 public computers and a laptop checkout program with over 100 Apple and Windows laptops, iPads, Apple Pencils, and iPad chargers that may be checked out from the Tech Lending room (Rm 117 Parks Library). Also located in Parks Library - ITS Solution Center, Online Learning Hub, and The Bookends Café.

## Career Services Offices

Agriculture and Life Sciences: 15 Curtiss Hall

Business: 1320 Gerdin Business Building

Design: 297 College of Design

Engineering: 3200 Marston Hall

Graduate Business: 1420 Gerdin Business Building

Human Sciences: 131 MacKay Hall

Liberal Arts and Sciences: 150 Carver Hall

Veterinary Medicine: 2270A Veterinary Medicine Complex

Career Services is a coordinated network of career services offices offering a broad range of programs and services for undergraduate, professional, and graduate students, faculty, staff, alumni, and employers. These services include career exploration, career development, experiential learning, and professional career search assistance programs. The goal is to provide constituents with life-long skills to assist with career development and exploration.

Programs and services are offered including online registration, position listing and interview scheduling; résumé referral; coordination of co-op and internship programs; workshops and seminars on career exploration, résumé preparation, letter writing, job search techniques, interview skills, applying to graduate and professional schools, and adjusting to the first job.

Each year career services sponsors multiple career fairs, which bring to the ISU campus hundreds of employers. The career services offices also coordinate on-campus interview opportunities. Each college career services office serves as a point of entry for students, alumni, and employers to the entire ISU network of coordinated, decentralized career services.

In addition to the college-based career services offices, the Career Exploration Service provides a variety of services to students who are unsure about their major or future career path. Students can work one-on-one with a trained career counselor, use the many books and electronic resources in the Career Exploration Center, or enroll in UST 104, Personal Career Development.

Additional information on career services is available at <http://www.career.iastate.edu/>.

## Child Care

Child Care Administration, a unit of Human Resource Services, supports Iowa State University families by linking them with programs and services that can help meet their child care needs. The university child care coordinator is available to assist families in accessing services available both on the campus and in the community.

Child care programs located on campus include:

- Center for Child Care Resources: Assistance in locating campus and community child care services, 100 University Village, Suite 1010, 515-294-8833 or 1-800-437-8599

- University Community Childcare, Family Resource Center, 100 University Village, 515-294-9838
- The Comfort Zone: Childcare for kids who don't feel so good, 100 University Village, 515-294-3333.
- Flex-Care: Part time care for children of ISU students, 100 University Village, 515-294-9838.
- University Child Care Center at Veterinary Medicine, 1700 Christensen Drive, 515-294-2273.
- ISU Child Development Laboratory School, Palmer HDFS Building, 515-294-3040.

For more information about child care options, contact the university child care coordinator at 515-294-8827.

# STUDENT LIFE

## Memorial Union

The Memorial Union completes the college experience by developing leadership, community, and career readiness. As the living room of campus, the "MU" serves students and the campus community through a variety of programs and activities.

515-296-6848; [www.mu.iastate.edu](http://www.mu.iastate.edu) (<http://www.mu.iastate.edu>)

### Arts, Entertainment, Recreation:

- CyBowl & Billiards: bowling, billiards, video arcade, table tennis
- Maintenance Shop: live music, comedy, open mic nights
- Student Union Board: weekly films, comedy, music, diverse programs, special events, much more
- Art exhibits, art gallery, and art-for-rent
- Workspace: art and crafts classes for fun, studios for work in wood, jewelry, pottery; button maker
- TVs, lounges, study spaces

### Student Organizations

- Student organization offices and meeting space; recognition process.
- Leadership skills development, training, and events.
- Community-service opportunities and trips

### Dining & Shopping

- Food Court & MU Market & Café
- Panda Express
- University Book Store

### Study Spots

- Multicultural Center
- Lounges: Main, West, Pride, Commons & more

### Services

- Meeting rooms, catering
- Event Management Office
- Parking ramp
- Soult's Family Visitor Center
- ATMs
- M-Shop Ticket Office
- Student Legal Services
- Military-Affiliated Student Center
- Center for LGBTQIA+ Student Success
- Sorority and Fraternity Engagement
- Student Government
- University Lectures

- International Students and Scholars Office
- New Student Programs
- NCORE/ISCORE

### Distinctive Feature

- Gold Star Hall, a living memorial to Iowa State service personnel lost in the nation's conflicts
- The Zodiac, it is advised to walk around the Zodiac to avoid any unlucky event

## Memorial Union Student Engagement Director of Student Engagement, Associate Director, Memorial Union

Kristine Heflin

### Assistant Director - Student Organizations, Leadership and Service

Kevin Merrill

### Service Learning and Student Organizations Coordinator

Tim Reuter

### Leadership and Student Organizations Coordinator

Hayley Goddard

### Coordinator for Art Programs and the Workspace

Letitia Kenemer

### M-Shop and Entertainment Coordinator

Jim Brockpahler

### CyBowl and Entertainment Operations Specialist

Nichole Woods

### Coordinator For Student Activities

Erin McCollum

### Student Government Advisor

Sophia Sarver

### Office Coordinator

Brigitte Milhous

Memorial Union Student Engagement is committed to helping students learn inside and outside the classroom by offering countless ways to get involved at Iowa State through leadership, service, arts, entertainment and recreation activities.

Student Engagement includes: the Workspace (arts studio), the Maintenance Shop (entertainment venue), CyBowl & Billiards (recreation center/ bowling alley), Cyclone Cinema, leadership and service programs,



art galleries in the MU, and management of the recognition of over 800 campus and student organizations. For a complete list of recognized organizations, visit <http://www.stuorg.iastate.edu>.

The staff provides assistance to student and campus organization leaders, members and advisors on an individual or group basis. Available on the Student Engagement website are resources for student and campus organizations including the event authorization process, publicity and promotion ideas, constitution writing guidelines, and officer transition information. MU Student Engagement is home to the Student Consultants that provide hands on support for students interested in leadership and service opportunities and student organization officers looking to better their clubs. In addition, Student Engagement offers a 3-credit course called Leadership ISU, where students learn leadership capacity through a series of activities and seminars, as well as many other leadership conferences and retreats. Reservations for the Lynn Fuhrer Lodge are managed by this office as well.

MU Student Engagement coordinates the Co-Curricular Transcript (CCT), an online system to help students manage their experiences, achievements and involvement while as an Iowa State student. Faculty and staff can add verified entries while students can add their own self-managed entries as well. Entries are added to one of the following categories: Campus Involvement, Community Service, Honors and Awards, Internships and Study Abroad, Leadership Experience, On Campus Employment, Publications, Recreational Activities, Research, and Seminars and Workshops. From there students can create customized and comprehensive transcripts to use when applying for jobs, internships, scholarships, graduate school or leadership opportunities.

Annual events include: Fall ClubFest & Spring ClubFest (organization involvement fairs), WelcomeFest (Ames and ISU opportunity fairs), ISU AfterDark (substance-free alternative program- six times per year), Iowa Student Leadership Experience (one-day leadership conference), and Winterfest (celebration of all things winter).

More information is available at the Memorial Union Student Engagement, located in the East Student Office Space in the MU (across from Panda Express); online at [www.studentengagement.iastate.edu](http://www.studentengagement.iastate.edu) (<https://studentengagement.iastate.edu/>) or by calling (515) 294-8081.

## Lectures

[www.lectures.iastate.edu/](http://www.lectures.iastate.edu/) (<http://www.lectures.iastate.edu/>)

The Committee on Lectures, funded by Student Government, brings to campus dozens of distinguished speakers in national and international affairs, the sciences, and the arts. In addition to giving formal lectures, many speakers meet with students for small-group discussions. Through the Lectures Program, students have access to a broad range of presentations, including popular culture, educational and economic topics, social issues, music and comedy, and technological and scientific

development. Past speakers include writer Ta-Nehisi Coates, physicist Michio Kaku, activist Edward Snowden, attorney Gloria Allred, U.S. Rep. Katie Porter, and U.S. Senator Ben Sasse. The Committee on Lectures also co-sponsors events hosted by student organizations and academic units.

Students are encouraged to contact the Lectures Program office and become involved in the planning of these events.

## Honor Societies

Honor societies at Iowa State University provide opportunities for students who excel in the classroom and want to network with others in their major. Members of these honor societies are eligible for transcript recognition through the Office of the Registrar. The complete list of honor societies (<https://www.stuorg.iastate.edu/organizations/12/type/>) can be found on the student organization website.



# EXCHANGE PROGRAMS & STUDY ABROAD

## Regent Universities Student Exchange Program

Iowa State University students may take courses at either of the other two Regent universities for Iowa State resident credit. Regular, degree-bound students in good standing at any of the three Regent universities may attend another Regent university for a maximum of two semesters, and the credits earned at the other university will be counted as resident credit at the home institution. Approval for participation and credit in the exchange program must be obtained well in advance of registration since the department head must approve the acceptance of such credits if these are to apply to the major, and to ensure complete processing of the application between the cooperating universities within specified dates for enrollment. Detailed information and application forms for the exchange program are available from the Office of the Registrar.

## National Student Exchange (NSE)

Iowa State University is a member of National Student Exchange. The NSE Consortium has 200 colleges and universities throughout North America providing academic and experiential exchange opportunities. Iowa State students with a cumulative GPA of at least 2.50 are eligible to apply. Credits earned as an NSE participant will be recorded on the students Iowa State transcript. Approval for credit in the NSE program should be sought from a student's academic advisor in advance of application. Detailed information and applications forms are available from:

National Student Exchange  
1080 Hixson-Lied Student Success Center  
(515) 294-6479  
nse@iastate.edu

[www.dso.iastate.edu/nse](http://www.dso.iastate.edu/nse) (<http://www.dso.iastate.edu/nse/>)

## Study Abroad

Studying abroad helps prepare students to meet the challenges of an increasingly interdependent global community. It's an adventure that challenges the student academically and provides real opportunities to interact with other cultures, languages, and lifestyles. The skills students gain while studying abroad will make them top candidates for internship placements and full-time positions post-graduation.

As a leading international university, Iowa State has a major commitment to study abroad, and the Study Abroad Center (SAC) is the central administrative office responsible for providing these opportunities.

We offer advising on study abroad, international internships, volunteer opportunities, and scholarships.

With over 50 study abroad programs available, from one week to an academic year in length and in nearly every major, students are able to find a program that meets their needs and interests so they can discover for themselves why study abroad is the most exciting academic adventure.

Exchange Programs offer students the opportunity to study abroad at a partner university while paying Iowa State tuition.

Semester in Australia, Germany, Ireland, Italy, New Zealand, Scotland and Wales offers unlimited placement opportunities for students to study at some of our most popular destinations for the fall, spring, or summer.

Programs led by our faculty offer Iowa State courses around the world. Short-term options can take you from the Antarctica to Uganda and to more than 40 other destinations.

For additional information, contact or stop by the Study Abroad Center. No appointment necessary!

Study Abroad Center  
281 Parks Library  
(515) 294-6792  
[www.studyabroad.iastate.edu](http://www.studyabroad.iastate.edu) (<http://www.studyabroad.iastate.edu>)

# STUDENT RECORDS

## Student Records

Iowa State University maintains various records concerning students, to document their academic progress as well as to record their interactions with university staff and officials. In order that their right to privacy be preserved and to conform with federal law, the university has established certain policies to govern the handling of student records. All policies conform with FERPA, the Family Educational Rights and Privacy Act (also known as the Buckley Amendment).

## Student Addresses

Students have the responsibility to notify the Office of the Registrar each time their information changes. Student information changes can be made through the Address Change link on the Student tab in AccessPlus (<https://accessplus.iastate.edu/frontdoor/login.jsp>).

Graduate Assistants and student employees must also report an address change to the office of University Human Resource Services (<http://www.hrs.iastate.edu/hrs/>). Information changes can be made through the Personal Information application in Workday (<https://workday.iastate.edu/>).

## When Records May Be Withheld

The appropriate university official may request that a student's record not be released if that student is delinquent in an account with the university or an affiliated organization. The effect of this action is that a transcript will not be released and registration will be withheld.

The appropriate official may also request that records be withheld in instances when official disciplinary action has been taken against a student. Authorization for these actions is supported by The Iowa Code and The Iowa Administrative Code.

In order for such an action to be rescinded, the Office of the Registrar must receive written authorization from the official who originally requested the action, indicating that the student has met the obligation. Further information about this policy can be obtained from the Office of the Registrar.

## Review and Challenge of Records

A student may challenge the accuracy of handling of records maintained by the university on grounds that the records are inaccurate, misleading, or otherwise violate the privacy or other rights of the student. The university has established the following procedures to provide an opportunity for the student to correct or delete inaccurate records, or to insert into the record a written explanation of the content. Students who question their records should discuss the issue first with the individual staff person who established or maintains the records. Presumably most

issues can be resolved at this level. If a satisfactory resolution cannot be reached, the student should submit the question to the head of the department in which the record is maintained.

The department head will discuss the issue with the staff person and the student challenging the record. If resolution cannot be reached after meeting with the department head, the student may submit the question to the dean or director to whom the department head is responsible. The dean or director will investigate, and will respond in writing.

If the record has not been reconciled through these measures, the student may direct a written request to the president of the university. The president will convene an Ad Hoc Hearing Panel of Access and Confidentiality of Educational Records, composed of two faculty members, two students, and one administrator, appointed by the president for a period of one year, with the president or a designee serving as nonvoting chairperson. The student shall be given an opportunity to present to the panel evidence relevant to the issues raised, and the panel will issue a written response.

## Posting Grades and Test Scores

Instructors who wish to inform students of their performance may post grades and test scores on a secure course website as long as individual students may only access their own grades. The test scores or course grades of students may not be posted in any public location unless the instructor posts the information using a code for each student that is known only by the instructor and the student.

## Release of Grades

Students who choose to release their grades to parents or other trusted third parties may do so using the AccessPlus third party system. Reports of a student's grades are not routinely sent to the student's parents.

## ISUCard and Identification Number

Each student is assigned a random university identification number on entry to the university. This number appears on the ISUCard that is provided to each student at the time of first registration. The ISUCard, may be required for some services and/or activities.

Loss of an ISUCard should be reported immediately to the ISUCard Office, where the lost card will be invalidated and replaced for a charge. Disciplinary sanctions may be imposed for improper use of the ID card or attempts to obtain, by fraudulent means, any form of identification.

## Social Security Number

Social security numbers are collected from prospective and current students, for administrative coordination and record identification purposes only. Although procedures have been established by the registrar for assignment of an alternative number upon request, students who wish to be employed on campus, desire to claim federal educational

tax benefits, or are applying to receive financial aid, are required by law to provide their social security numbers for administrative use. The social security number is a confidential record and is maintained as such by the university in accordance with the Family Educational Rights and Privacy Act.

## Policy on Student Names

Iowa Regent universities have a common policy regarding student names and name changes. The name on the student record should be the student's complete and legal name; however, we understand and respect that not all students identify with their legal name. If a student does not have the official legal documentation required in the standard Name Change Policy to support their legal name change, the Office of the Registrar will work with the student to still process the name change. In evaluating and processing all name change requests, the university reserves the right to require adequate and appropriate documentation, as warranted. After a name change, a current student must obtain a new ISUCard; a replacement fee may apply.

## Consumer Information

The Higher Education Opportunity Act of 2008 (HEOA) requires that postsecondary institutions participating in federal student aid programs make certain disclosures to enrolled and prospective students, parents, employees, and the public. The consumer information policy is available at <https://web.iastate.edu/about/consumer> (<https://web.iastate.edu/about/consumer/>). Students without electronic access can obtain the information from the Office of the Registrar, 214 Enrollment Services Center, 515-294-1840 or from the Office of Admissions, 100 Enrollment Services Center, 515-294-5836. A paper copy of the information will be provided upon request.

### Iowa State University Online Directory Information

The ISU Online Directory (<https://www.info.iastate.edu/>) differentiates between verified and guest users:

**Verified Users** - those accessing the directory from an on-campus server or via Iowa State University's virtual private network (VPN) or other authenticated means.

Information available for display to **verified users** include:

- Name
- Major
- Classification
- ISU Email Address

**Guest Users** - those who are external, unauthenticated individuals.

Information available for display to **guest users** include:

- Name
- Major
- Classification

Guest users do not have access to view Iowa State University email address, but they do have the ability to send an email to the student via a webform.

## Public Information at Iowa State University

Online directory information and public information may be released to the public upon request, except in cases where the student has suppressed the release of their information. Iowa State reserves the right to review and respond to the requests for release of public information on a case-by-case basis. While FERPA may authorize the release of student information, it does not obligate a school official to do so. See list below for specific types of public data.

### Online Directory Information

- Name
- Major
- Classification
- ISU Email Address (for verified users)

### Other Public Information

- Hometown
- Dates of Attendance at ISU
- Expected date of graduation
- College
- Awards and academic honors
- Iowa State degree(s) and date(s) awarded
- Previous educational institutions attended, degrees received, dates of attendance
- Full-time or part-time status
- Participation in officially recognized activities and sports
- Weight and height of members of athletic teams

Students can withhold public information through the Address Change link on the Student tab in Access Plus (<https://accessplus.iastate.edu/frontdoor/login.jsp>).

## Confidential Information

With the exception of the information noted above, all student records are considered to be confidential and are open only to school officials. A school official is a person employed by the university in administrative, supervisory, academic or research, or support staff position (including law enforcement unit personnel and health staff); a person or company with whom the university has contracted; or a student serving on an official committee, such as a disciplinary or grievance committee, or assisting another school official in performing his or her tasks. A

school official has a legitimate educational interest if the official needs to review an education record in order to fulfill his or her professional responsibility. Iowa State University's notification of rights under FERPA can be found at <http://www.registrar.iastate.edu/policies> (<http://www.registrar.iastate.edu/policies/>).

The following policies govern access to student records:

1. Each type of student record is the responsibility of a designated school official, and only that person or the dean or director to whom that person reports has authority to release the record. The following is a list of the responsible officials:

- a. Academic records: University Registrar
- b. Admissions records: Director of Admissions
- c. Financial aid records: Director of Student Financial Aid
- d. Student financials: Director of Accounts Receivable
- e. Traffic and security records: Director, ISU Department of Public Safety
- f. Medical records: Director, Thielen Student Health Center
- g. Counseling records and test scores: Director, Student Counseling Service
- h. Actions of Academic Standards Committees: College Deans
- i. Disciplinary records: Dean of Students, Office of Student Conduct
- j. Residence hall records: Director of Residence
- k. Evaluations for admission to ISU graduate or professional programs: College Deans or Department Chairs
- l. Special academic programs: Faculty member in charge of the program and the Dean of the college
- m. Student employment: Director of University Human Resources

2. The designated official may release records to other school officials who have a legitimate need for the information. A list of those persons who normally have access to each type of student record from the Office of the Registrar.

3. All student records are reviewed periodically. Information concerning the frequency of review and expurgation of specific records is available from the Office of the Registrar.

4. Students have the right to review upon request any records that pertain directly to them, and may obtain a copy of the record for a fee. This provision does not apply to records to which the student has waived their right to review (e.g. letters of recommendation), nor does it apply to medical and counseling records.

5. A student may waive the right to review a specific record by submitting in writing a statement to this effect to the official responsible for that record.

6. A file containing copies of records pertinent to advising is maintained on each student for use by the student's advisor. This file may be

maintained in hard copy or electronic format. Ordinarily this file is kept in the possession of the advisor, but for convenience it may be stored elsewhere such as in the dean's office or department office. When the student changes majors, or changes advisors within the same major, the file is transferred to the new advisor. Under the university's student records policy, the student is considered to have the right of access to this file.

7. Medical and counseling records shall be released at the written request of the student to medical or psychological professionals outside the university or to university officials.

8. University personnel who have access to student records in the course of carrying out their university responsibilities shall not be permitted to release the record to persons outside the university, unless authorized in writing by the student or unless one of the exceptions stated earlier is involved.

9. Confidential information may be released by students to their parents or other trusted third parties through the AccessPlus third party system. Confidential information may also be released by obtaining the student's written consent or by having the parent establish the student's dependency as defined by the Internal Revenue Code of 1954, section 152, by furnishing a certified copy of the parent's most recent federal income tax return.

10. The officials responsible for custody of student records will maintain records of requests and disclosures of personally identifiable nonpublic information. The records of requests, whether granted or not, shall include the person or agency requesting the information and the purpose of the release. These records of requests and disclosures will be available to the student on request. Records of requests and disclosures are not necessary for requests made by the student, by school officials in carrying out their official responsibilities, by persons employed by agencies and offices conducting audits and accreditations of university programs, or any of the other exceptions listed previously.

For the purposes of FERPA, Iowa State University defines Directory Information to include both Online Directory and Other Public Information as defined above.

It is the policy of the university to respect the privacy of students; therefore, only lists containing Directory Information may be made available to members of the public when deemed appropriate and necessary, and in accordance with all applicable Iowa State policies and procedures. While FERPA allows for the release of such information, it does not obligate the university to do so; Iowa State University reserves the right to review and respond to requests for release of information on a case-by-case basis.

Directory Information will be provided at a cost. A sub-set of Directory Information is available via the Online Directory (<https://www.info.iastate.edu/>); please note that the Online Directory differentiates between verified and guest users and displays information accordingly. More information on this can be found in the Public Information section of the University Catalog.

### **Disclosures Permitted by FERPA**

Iowa State University retains the discretion to disclose Directory and Confidential Information as indicated in Section 4 (<http://www.registrar.iastate.edu/policies/>) of Iowa State University's Notification of Rights Under FERPA. Specifically, the university may disclose to the public or to specific individuals, Directory and Confidential Information for reasons of safety if the disclosure meets the criteria under Section 4 (<http://www.registrar.iastate.edu/policies/>).

# ACADEMICS

## Classification/Class Standing

Undergraduate classification/class standing (i.e., year in school) is determined by the number of credits completed, and it is based on credit hours earned, not merely credit hours attempted. The grades F and NP and the marks I and X do not contribute toward credit hours earned and thus are not considered in determining class standing. See Grades for information about the grading system at Iowa State University.

Classification in all academic colleges, except Veterinary Medicine, is as follows:

**Sophomore:** 30 credit hours earned

**Junior:** 60 credit hours earned

**Senior:** 90 credit hours earned

Students who have a bachelor's degree and are working toward another undergraduate degree, licensure, or admission to a specific graduate or professional program, are typically classified as a senior.

Transfer students without a degree are classified on the basis of credits accepted by Iowa State University.

Veterinary medicine students are promoted from the first- to the second-, third-, and fourth-year classes based upon satisfactory completion of the required courses for each year. To be promoted to the second-year class, students must have a cumulative grade-point average of at least 1.67 for all courses in the first year of the veterinary medicine curriculum. To be promoted to the third- and fourth-year classes, students must have a cumulative grade point average of at least 2.00 for all courses in the professional curriculum.

A student, who is attending Iowa State and decides not to work toward an undergraduate degree, will be classified as a special (non-degree) student. Admission requirements and academic standards regulations are the same as regular students. Credits taken as a special (non-degree) student are applicable for undergraduate degree purposes if the student is admitted later as a regular undergraduate. Credits obtained as an undergraduate special student may not, however, be applied toward a graduate degree.

## Degree Planning/Academic Progress Report

### ISU Degree Audit/Academic Progress Report

In addition to being properly registered, students are responsible for knowing the requirements for their degree and planning their schedule to

meet those requirements. One way to monitor progress toward a degree is with the ISU degree audit/academic progress report.

Students may access their ISU degree audit through AccessPlus (<https://accessplus.iastate.edu/frontdoor/login.jsp>). The degree audit/academic progress report shows courses that have been completed, courses in which the student is currently enrolled, and graduation requirements that need to be completed for the student's curriculum.

Students should use this information to help them review progress towards their degrees(s), plan their course of study to complete degree requirements, and select courses for the next term. Graduation evaluators in the Office of the Registrar use the degree audit/academic progress report during the term a student will graduate to determine if the student will meet all degree requirements upon successful completion of the courses on the student's schedule that term.

Students may request a degree audit for any major available at Iowa State. The audit results will show how the student's completed- and in-progress course work applies toward other majors or options offered at the University.

For further information about how completed courses fulfill degree requirements or how other courses will apply toward their degree requirements, students should see their advisor.

## Catalog in Effect

A student may choose to graduate under the catalog in effect at the time of graduation or a catalog for the previous six years, provided it covers a period of the student's enrollment at an accredited college or university. Full requirements of the chosen catalog must be met except that adjustments will be made in instances where courses are no longer available or where programs have been changed.

## Bachelor's Degree

To receive a degree, a student must meet the requirements of the curriculum in which the degree is to be awarded. Verification that the student has met those requirements is made by the dean of the college, who also has the authority to waive a requirement under exceptional circumstances.

A minimum of 120-semester credits and a cumulative grade point average of at least 2.00 in all work taken at Iowa State University is required for graduation.

A student admitted as a transfer student from another college or university is required to have a 2.25 cumulative grade point average at the time of entrance. A transfer student who has earned an associate's degree is required to have a 2.00 cumulative grade point average at the time of entrance.



No more than 65 semester or 97 quarter credits earned at two-year colleges can be applied to a bachelor's degree from Iowa State University. There is no limit to the number of credits that may be transferred from a four-year institution.

To qualify for a bachelor's degree, a student must take a minimum of 32 credits in residence at Iowa State University. Also required is that the last 32 credits must be completed at Iowa State University, although under special circumstances, with prior written approval of the student's major department, six of the last 32 credits may be transferred and applied toward a degree at Iowa State University. Credits earned while students participated in an ISU Study Abroad or National Student Exchange program are exempt from this requirement.

A student who takes work at another college or university after having been enrolled at Iowa State must submit transcripts of all work attempted to the Office of Admissions at Iowa State. Failure to submit such transcripts will be grounds for dismissal.

In unusual circumstances, the Academic Standards Committees of the respective colleges may review and give further consideration to the records of students who, except for grade-point average, have satisfactorily completed all graduation requirements. If the appropriate college Academic Standards Committee considers that the educational and professional needs of such a student have been satisfactorily met, or can be satisfactorily met by imposing further conditions, the committee may recommend to the dean of the college that the student be graduated or that a supplemental program be accepted in place of the fully unqualified grade point average. The college Academic Standards Committee chairperson reports such exceptional actions to the Faculty Senate Committee on Academic Standards and Admissions.

## Two Bachelor's Degrees

Students may receive two bachelor's degrees if the degree requirements for each major are met, including those for general education requirements, and the total number of semester credits earned is at least 30 more than the requirements of the major requiring the greater number of credits. This rule applies whether or not the degrees are awarded at the same time. Students should have an academic advisor in each major, with one advisor being designated as the registration advisor. Students should request approval to pursue two degrees by completing the Curriculum Change Form (<https://www.registrar.iastate.edu/sites/default/files/uploads/forms/Curriculum%20Change%20Form%201%2021.pdf>). Each advisor will have access to the student's information after this form has been processed. The appropriate department and college must approve each degree program.

Students who have earned advanced degrees and wish to earn a second Bachelor's Degree may be eligible for a college waiver of certain basic

and general education requirements. Students should contact the department offering the major for advice and appropriate planning.

## Double Major

A double major is a program for a single degree in which all requirements for two or more majors have been met. The majors may be in different colleges or within the same college or department. The diploma and permanent record will designate all majors that are completed at the same time.

To declare a double major, students should complete the Curriculum Change Form (<https://www.registrar.iastate.edu/sites/default/files/uploads/forms/Curriculum%20Change%20Form%201%2021.pdf>). This form, available from advisors and classification offices, should be completed at least one term prior to graduation. One major should be designated as primary and the other secondary for purposes of record keeping, but the student's rights and responsibilities are the same in both majors. The advisor of the primary major will serve as the student's registration advisor, but both advisors will have access to the student's information. Degree programs must be approved for each major by the appropriate department and college. One of the majors may subsequently be canceled using the same form.

Students in the College of Engineering are able to earn a degree with a second major as long as the second major is within another college, meets all requirements of the additional programs and contains a minimum of 15 additional credits beyond the requirements for a B.S. degree in engineering for each additional area of study. A student with multiple curricula within the College of Engineering is permitted to earn only multiple degrees. All requirements for each curricula must be met plus an additional 30 credits for each curricula being pursued beyond the curriculum which requires the most credits.

Students with a primary major in another college who wish to take a second major in the College of Liberal Arts and Sciences are not required to meet the Liberal Arts and Sciences General Education requirements. They must, however, meet all requirements for the major, including complementary courses. Students in the B.L.S. curriculum in the College of Liberal Arts and Sciences are not eligible to add additional majors.

## Second Major Completed after the Bachelor's Degree

After receiving a bachelor's degree, a person may wish to complete all requirements for another major. Approval of the department of the second major is needed before study for the program is begun. At the completion of the program a notation will be made on the permanent record (transcript), but no change will be made on the diploma received at the time of graduation. A degree program must be approved for the second major by the department and by the dean's office.

## Changing Major

A student's freedom to change their major, and the procedure that should be followed, depend on the student's academic standing and on policies of individual colleges as approved by the provost.

If students have never been dismissed and reinstated, they may change their major by consulting first with their advisor. Procedures for changing their major are as follows:

1. If the change involves majors within the same college, they should check with the college office to obtain instructions as to how to make the change.
2. If the change involves majors in different colleges, they should obtain a Curriculum Change Form (<https://www.registrar.iastate.edu/sites/default/files/uploads/forms/Curriculum%20Change%20Form%201%2021.pdf>) and their file from their advisor, present these materials to the student services office of their present college, then to the student services office of the college to which they are transferring, and finally to the office of their new major.
3. Students on academic probation (P) may be restricted by rules outlined in the section on Additional Academic Standards Regulations.
4. Students who have been reinstated may not transfer to another college within the university during the first term following reinstatement, and they may not at any time transfer back to the college that originally dismissed them without the permission of the academic standards committee of that college.

## Undergraduate Minor

To declare a minor, students must submit a completed Request for a Minor form to their college office at least one term before graduation. The minor may be from the catalog under which the student is graduating or a later catalog.

Requirements for an undergraduate minor are specified by many departments and programs in the university; a record of completion of such requirements appears on a student's transcript. Specific requirements and/or restrictions are available from the department or program offering the minor.

An undergraduate minor has the following requirements and understandings:

1. All minors require at least 15 credits, including at least 6 credits taken at Iowa State University in courses numbered 300 or above.
2. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.
3. Credits used to meet the minor requirements may also be used to satisfy the credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

4. Some students may have to exceed the graduation credit requirement set by their college in order to meet the requirements of both the minor and the curriculum/major.
5. Courses taken for a minor may not be taken on a pass-not pass basis.

## Undergraduate Certificate

An undergraduate certificate provides a way to give formal recognition of focused study in a specialized area that is less comprehensive than required for an undergraduate major. The requirements of the certificate program will determine if an associate or baccalaureate degree is required for the award of the certificate.

An undergraduate certificate has the following requirements and understandings:

1. A student has received either an associate of arts (AA) or associate of science (AS) degree or a baccalaureate degree from any accredited institution or will earn an ISU baccalaureate degree at the same time or before the requirements for the certificate are completed.
2. Admissions Criteria
  - a. Students earning a certificate with a baccalaureate degree must meet all ISU admission requirements for either freshman (<https://www.admissions.iastate.edu/freshman>) or transfer students (<https://www.admissions.iastate.edu/transfer>)
  - b. Students earning a certificate without an ISU baccalaureate degree apply as a non-degree seeking student and will be asked by Admissions if their intent is to declare a certificate. Students must have earned an associate of arts, an associate of science, or baccalaureate degree prior to being admitted to the certificate program. Students should refer to the admissions website ([https://www.admissions.iastate.edu/nondegree/undergraduate\\_requirements](https://www.admissions.iastate.edu/nondegree/undergraduate_requirements)) for admission requirements for nondegree undergraduate students. Students must meet any additional admission requirements for the certificate.
3. Requirements for Certificates
  - a. A minimum of 20 credits, with at least 12 credits taken at ISU which are applied towards the undergraduate certificate requirements. All prerequisite requirements for the certificate must be met as part of fulfilling the requirements for the certificate.
  - b. At least 9 of the credits taken at Iowa State University must be in courses numbered 300 or above.
  - c. The certificate must include at least 9 credits that are not used to meet any other department, college, or university requirement. Credits used to meet the certificate requirements may be used to



satisfy the credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

- d. Courses taken for a certificate may not be taken on a pass-not pass basis.
  - e. A cumulative grade point average of at least 2.00 is required in all courses taken at ISU towards the certificate.
  - f. A student may not receive both an undergraduate major and a certificate of the same name.
4. Awarding of Certificates
- a. The following criteria must be met prior to the award of a certificate:
    - i. For students earning an ISU baccalaureate degree, a certificate is awarded concurrent with or after the ISU baccalaureate degree.
    - ii. For students that have received a baccalaureate, associate of arts, or an associate of science degree from any accredited institution, a certificate is awarded upon completion of the certificate requirements.
  - b. A notation of a completed certificate will be made on a student's transcript and a printed certificate will be awarded.

## Communication Proficiency Policy

**Basic Principles:** The faculty of Iowa State University believe that all educated people should be able to communicate effectively in a variety of settings and media, including electronic. Consequently, Iowa State University graduates are expected to develop competence in three interrelated areas of communication: written, oral, and visual.

This communication competence can best be achieved through the following five principles:

- Communication instruction and practice are distributed over the student's entire undergraduate experience, both in and out of the classroom, from the first year through the senior year.
- Communication instruction and practice are distributed across the curriculum, both in communication courses and in courses in the student's major.
- Active learning and higher-order thinking are fostered through communication.
- Faculty across the university share responsibility for the student's progress in communication practices.
- Both faculty and students engage in ongoing assessment for continuous improvement of the student's communication practices.

Iowa State University's communication curriculum, based on these five principles, seeks to enrich the student's understanding of the various subjects studied as well as prepare the student to communicate successfully in professional, civic, and private life.

## Foundation Courses

To ensure that broad communication competence is addressed and developed at the beginning of a university career, all students will earn six credits in the two-course introductory sequence (ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition), normally taken in the first and second years. Students will focus on writing and critical reading, with complementary instruction in visual, oral, and electronic communication; they will concentrate on civic and cultural themes; and they will enter work in a communication portfolio to document their current level of proficiency.

**Communication Proficiency Grade Requirement:** At a minimum, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250; some majors/degree programs may set higher requirements for communication proficiency.

## Upper-Level Curricula

Continuing development of communication skills will be directed by the student's major department. Using the university's basic principles as a guide, each department will specify a set of intended learning outcomes and design communication experiences by which students in the major can achieve the desired level of communication proficiency.

Departments may select from or combine a variety of communication options that best match their faculty, students, and curriculum:

- designated communication-intensive courses that integrate written, oral, and visual communication into a course in the major;
- a sequence of courses within the major that incorporates communication tasks of increasing complexity;
- linked courses—one in communication, one in the major—that integrate readings and assignments;
- advanced composition course(s) appropriate to the student's major and offering instruction in written, oral, and visual communication;
- communication-intensive activities within or beyond course work, such as communication portfolios, discipline- or course- specific student tutoring, community service projects, internships, electronic presentations, informational fairs, juried competitions, entrepreneurial projects, newsletters, Web sites.

Departments will retain the authority for regularly assessing the degree to which their students achieve the specified learning outcomes and for making curricular improvements based on departmental assessment data.

**Non-Native Speakers of English:** Students admitted to the university who are graduates from non-U.S. high schools and whose first language is not English are required to take the English Placement Test before the beginning of their first semester of enrollment as students at Iowa State. This requirement includes freshmen as well as those who have

transferred credit from other institutions. The test is administered by the English Department and is offered before the beginning of each semester. Students whose performance on this placement examination is satisfactory will follow the regular university communication proficiency requirements. Students who have deficiencies will enroll in special English classes, as determined by the test results.

## U.S. Diversity and International Perspective Requirements

One of Iowa State University's goals is to prepare its students to meet the challenges of responsible civic engagement and effective professional roles in a culturally diverse global community and workplace. To help achieve this goal, all undergraduate students must fulfill graduation requirements in two areas: U.S. Diversity and International Perspectives. At a minimum, students can fulfill this requirement with three credits of course work (or the equivalent in some alternative academic experience) for each area. In most cases, courses used to meet the U.S. Diversity and International Perspectives requirements can also be used to fulfill general education requirements of the student's college or requirements of the student's major. Students should consult with advisors for details of the requirements in particular majors.

The focus of the U.S. Diversity requirement is understanding the social complexity of human beings based on analytical categories such as race, ethnicity, or gender, and the ways those categories have excluded historically marginalized groups. Intersectional understandings of diversity consider other categories of identity (e.g. sexuality, culture, and religion) related to race and ethnicity. A diverse and robust education means exploring these social complexities in a structured learning environment to familiarize students with the historical, societal, and political contributions of diverse populations.

List of approved U.S. Diversity Courses (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>) - please refer to this list for the most up-to-date courses approved as U.S. Diversity (this list will continue to be updated following the publication of this document).

Through completion of the U.S. Diversity requirement, students will achieve at least three learning outcomes such as those listed below.

Students will be able to:

- identify the experiences and contributions of underrepresented or marginalized groups and how they have shaped the history and culture of the United States
- understand the analytical concepts of culture, ethnicity, race, gender, sexuality and/or religion and be able to apply these concepts to an analysis of the United States

- analyze systemic oppression and personal prejudice and their impact on marginalized communities and the broader U.S. society
- evaluate important aspects of diversity, equity, and inclusion so they can live, work, and collaborate with others in the 21st century United States

The focus of the International Perspectives requirement is the global community. Its objective is to promote students' understanding of cultural diversity and interdependence on a global scale. A period of immersion in a foreign culture is often a particularly effective way of meeting these objectives, so Iowa State University encourages the use of study-abroad experiences as a means of fulfilling the International Perspectives requirement. International students, because they are "studying abroad" from their home country's perspective, are normally deemed to have met the International Perspectives requirement. The International Perspective requirement shall be waived for U.S. military veterans who have completed at least three months of service stationed outside of the United States.

List of approved International Perspectives Courses (<https://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)

Through completion of the International Perspectives requirement, students will achieve at least two learning outcomes such as those listed below.

Students will be able to:

- analyze the accuracy and relevancy of their own worldviews and anticipate how people from other nations may perceive that worldview.
- describe and analyze how cultures and societies around the world are formed, are sustained, and evolve.
- analyze and evaluate the influence of global issues in their own lives.
- describe the values and perspectives of cultures other than their own and discuss how they influence individuals' perceptions of global issues and/or events.
- communicate competently in a second language.

## Academic Grievances and Appeals

Students who believe a faculty member (in his or her academic capacity) has behaved unfairly or unprofessionally may have their grievance reviewed through the procedure described below. A student may not initiate an academic grievance more than one year following completion of the course, and may not initiate the grievance of a course grade beyond midterm of the semester following completion of the course.

Prior to initiating a formal grievance, a student may wish to discuss the situation informally with the Dean of Students or designee, who can offer advice as to the most effective way to deal with it.

Grievances arising out of classroom or other academic situations should be resolved, if at all possible, with the student and the instructor involved. If resolution cannot be reached, or if the grievance involves sexual or racial harassment and the student prefers not to deal directly with the instructor, the student should discuss the grievance with the instructor's department chair and submit it in writing to him or her. The department chair will investigate the grievance, including discussing it with the instructor involved and/or referring it to a departmental grievance committee. The department chair should respond in writing within five class days of receipt of the written notice of the grievance.

If the student is not satisfied with the resolution of the grievance proposed by the department chair, the student may appeal within 45 calendar days in writing to the dean of the instructor's college. (In the case of a grievance involving a Graduate College policy or procedure, an appeal of the chair's decision should be directed to the Dean of the Graduate College rather than to the dean of the instructor's college.)

The dean will hear the explanations of the department chair and instructor, and should respond to the student in writing within ten class days of receipt of the written notice of the appeal. If the grievance cannot be resolved with the dean, the student may forward within 45 calendar days a written appeal to the provost, who will convene a Committee to Review Student Grievances (see below) to consider the appeal within fifteen calendar class days of receipt of the written notice of the appeal.

Within ten calendar days following the convening of the committee, the provost will make a decision with regard to the grievance and will transmit this decision in writing to the grievant, the dean, the department chair, and the instructor. An appeal of the provost's decision may be made within 45 calendar days to the president of the university. The time limit specified at each level may be extended by mutual agreement of all parties concerned.

The Committee to Review Student Grievances is composed of faculty members named by the president of the Faculty Senate and students named by the president of the Student Government. The provost may serve as a chairperson for the committee, or may designate another chairperson for a specific grievance hearing. A minimum of two faculty members, two students, and the chairperson shall constitute a quorum for the convening committee.

## Attendance and Absences

### Class Attendance

In order to attend a given class, a student must be registered for that class for credit or audit. Exceptions to this policy are at the discretion

of the instructor of the course. See Index, Validating Enrollment for regulations concerning attendance to validate students' enrollment in a class.

Students are expected to attend class meetings as scheduled. Each instructor sets his or her policy with respect to class attendance, and excuses for absence from class are handled between the student and instructor. The instructor is expected to announce his or her policy at the beginning of the course.

Additional information regarding discretionary accommodation for disability and religion are available at <http://www.hrs.iastate.edu/AAO/eod/reasonaccom.shtml> (<http://www.hrs.iastate.edu/AAO/eod/reasonaccom.shtml/>)

### Veteran Attendance

In accordance with the requirements of the Servicemembers Improved Transition through Reforms for Ensuring Progress Act (SIT-REP Act, December 31, 2018), the University will not deny access to classes or facilities to a Veteran or eligible dependent due to a late payment from the Veterans Administration. This is only applicable to Veterans or eligible dependents who are receiving educational assistance under Chapter 31 (VR&E) or 33 (Post 9/11 and Fry Scholarship) of title 38, United States Code (U.S.C.). For the purposes of this policy, "Denial of Access" shall be defined as "to prohibit the entry, participation, or attendance to an event or facility otherwise afforded to all registered students." More information about this policy is available at <https://catalog.iastate.edu/tuitionfees/#feepaymenttext>.

Students who receive benefits from the Veterans Administration required by the V.A. to attend class regularly to maintain their V.A. eligibility. If the instructor knows that a student receiving V.A. benefits is not attending class, the instructor is obligated to notify the Office of the Registrar and a notification will be forwarded to the Veterans Administration. More information about veteran benefits is available at <http://www.veterans.iastate.edu>. (<http://www.registrar.iastate.edu/veterans/>)

### Field Trips/Curricular-Related Activities

Trips away from campus as part of a course are often appropriate educational experiences. They may not, however, take place during the first or last week of the semester, nor may they extend over more than two consecutive class days (Monday -Friday); these regulations may be waived only by special permission of the dean of the college in which the course is offered. Students should consult with instructors whose classes will be missed. If a mutually satisfactory agreement between the instructors and the student cannot be reached, the student cannot be required to attend the curricular-related activity or be penalized by the instructor for missing the curricular-related activity.

Special fees are often charged to cover the costs of field trips. Field trip fees are noted in the Schedule of Classes (<http://classes.iastate.edu/>).

### Excusable Absences for Non-Curricular Reasons

Students who miss class for non-curricular reasons are responsible for completing all assigned course requirements in a timely manner. Instructors should provide timely opportunities for students to make-up or replace missed scheduled examinations and/or assignments resulting from an excusable absence. While instructors are free to change the format of make-up examinations or assignments, students will be evaluated by the same standards as other members of the class.

In all cases, the person responsible for the event or activity should provide participants with a letter explaining the proposed absence and its duration including travel times for off-campus events and activities. Students must provide this documentation to instructors at least 10 days in advance of the activity or event, except when such notice is not possible.

Course instructors retain final authority regarding student absences and how they impact course grades and the acceptability of a student's work toward passing their course. If a student must miss, for any reason, a portion of a course that, in the considered opinion of the course instructor, is critical to the student's ability to meet the course objectives, the instructor must recommend alternative actions to the student, which may include dropping the class.

### Extra-Curricular Activities as a Representative of the University

Students may seek to or be asked to participate as an Iowa State University representative in non-credit events (competitions, conferences, presentations, programs, and performances) scheduled by academic or athletic units of the university at times that conflict with scheduled classes.

Instructors shall excuse students who miss class while representing Iowa State University in official department-or university-sponsored activities, including:

- academic or professional conferences and workshops
- intercollegiate athletic, academic, and judging competitions
- musical, theatrical, dance and other artistic performances
- presentations or programs given to external audiences

### Other Extra-Curricular Activities

Instructors will determine whether other absences not officially sponsored by a unit of the University (e.g., conference attendance, job interviews), will be treated as excused.

### Military Service

Instructors shall excuse absences due to performing required National Guard or other United States military service obligations (other than annual training). When a student is called to active duty for more than two weeks, instructors should meet with the student and the student's advisor to discuss the situation and academic options. University procedures are in place for such situations and should be followed.

### Court Appearances

Instructors shall excuse absences due to officially mandated court appearances including jury duty.

## Examinations and Evaluation Evaluation Procedures

It is university policy that the instructor shall inform the students at the beginning of each course of the evaluation procedures planned for use in the course.

### Retention of Records

Records of all graded work must be retained by the instructors until midterm of the semester following completion of a course or until all pending appeals and incompletes are resolved, whichever is later. Instructors leaving the university must file records of all graded work with their department office before departure.

### Examinations

Examinations are one of the most common ways instructors assess student performance. In order that examinations can be a useful part of the educational process, the following policies have been instituted:

1. One purpose of examinations is to help students' learning. Therefore, examinations should be evaluated as soon as possible after they are given and the results should be made available to the students in a timely way to enhance learning.
2. All tests and examinations administered between the beginning of the term and final examination week shall be held during a regularly scheduled lecture or laboratory class period for that course. A department may obtain approval to administer a separately scheduled examination if all of the following criteria are met:
  - a. The course is multi-sectioned.
  - b. A common departmentally developed examination will be administered to all students in all sections at the same time.
  - c. The test scores will be used as a basis for a uniform grading procedure for all sections of the course. Requests to hold separately scheduled examinations must be made to the registrar and approved by the provost in time to be announced in the Schedule of Classes to allow students to plan in advance. Only

under unusual circumstances will a course be approved for separately scheduled examinations if the deadline is past to include notification in the Schedule of Classes. Whenever a separately scheduled examination is administered, a regular class meeting during that week shall be omitted.

Students who are unable to take a separately scheduled examination at the scheduled time indicated in the Schedule of Classes, because of a course conflict or other legitimate reason must notify the instructor in advance and must be given the opportunity to be examined at another time mutually convenient for the student and the instructor. The instructor shall determine whether to administer the same examination or an alternate examination, or use an alternate assessment procedure.

3. At the end of the semester, a week is set aside for final examinations or other term evaluations, with a two-hour period normally scheduled for each course. The following policies govern the responsibilities of students and faculty members during this week:

- a. Final exams may not be given at a time other than that for which the exam is scheduled by the registrar. An instructor may not give a final exam prior to final exam week nor change the time of offering of the final examination as it appears in the final exam schedule. Permission to change the time for which an exam is scheduled may be given only by the dean of the college. If the instructor elects not to give a final exam in a course of two or more credits, the class is required to meet at the scheduled final exam period for other educational activity such as a review of the course or feedback on previous exams.
- b. Final exam periods are determined according to the regularly scheduled meeting time of the class. However, certain courses are assigned special group exam times so that several sections of the same course may be tested together. The criteria for establishing special group exams are similar to those listed for separately scheduled exams listed in number 2 above. If this results in conflicting group examination periods, students should inform the instructor in charge of the first of the two conflicting courses as listed on the final exam schedule within the special groups in question; that instructor is responsible for arranging a special examination or making some other adjustment.
- c. Evening courses with lectures scheduled at 6:00 p.m. or later should give their examinations during finals week from 7:00-9:00 p.m. on the day the class normally meets. If this exam conflicts with an evening group exam, the instructor responsible for the latter must arrange a special examination for any students who have a conflict.

- d. If unusual circumstances involve the need for students to change the time of their final examination, they must obtain the approval of the instructor of the course.
- e. If a student has three examinations scheduled on the same calendar day and wishes to change one to another day, the instructor of the course having the smallest number of students is responsible for arranging an alternate examination time for the student unless make-up exam times are available in one of the other courses.
- f. All faculty members and teaching assistants with instructional or grading responsibilities are considered to be on duty throughout the entire final examination week and are expected to be available to students during that week for discussion of any matters pertaining to the final examination and final grade or to other aspects of the course.

## Prep Week

For each Fall and Spring semester, the last full week of classes before final examinations is designated as Prep Week. The intent of this policy is to establish a one-week period of substantial and predictable study time for undergraduate students. During the Prep Week period, regular lectures are expected to continue, including the introduction of new content, as deemed appropriate by the instructor. The restrictions established by this Prep Week policy are:

- Due dates for mandatory graded submissions of any kind that fall within Prep Week must be listed on the syllabus provided at the start of the course.
- Mandatory final examinations may not be given during the Prep Week period except for laboratory courses or courses that meet weekly and for which there is no contact during the normal final examination week.
- Registered ISU Student Organizations may not hold any meetings, functions, or sponsored events during the Prep Week period. Any exception to these restrictions must be authorized in advance by Office of the Dean of Students.

## Scholastic Recognition

The university recognizes those students who are doing exceptionally well in several ways, including the following.

1. **Dean's List.** Each semester the university issues a dean's list made up of those students who have carried at least 12 credit hours of graded or S-F courses with a 3.50 grade-point average or above for the semester. Courses taken on a P-NP basis do not count as part of the 12-credit



hour requirement. No dean's list is issued for summer school. The list can be viewed from the Office of the Registrar website (<http://www.registrar.iastate.edu>).

**2. Top 2 Percent.** Each spring semester, undergraduate students in the top 2% of their class (freshman, sophomore, junior, and senior) within their college, based on cumulative grade point average, are recognized. In addition to a congratulatory letter from the university president, a notation of the accomplishment is recorded on the student's permanent record.

**3. Graduation with Distinction.** Undergraduates who have a cumulative grade point average of 3.50 or higher (based on a 4.0 scale) are eligible to graduate "with distinction" provided they have completed the following criteria for their degree. The student's distinction will be based upon their cumulative grade point average after all degree requirements have been satisfied.

These students are recognized as follows:

- Summa Cum Laude: cumulative grade point average of 3.90 or higher.
- Magna Cum Laude: cumulative grade point average of 3.70 to 3.89.
- Cum Laude: cumulative grade point average of 3.50 to 3.69.

The recognition appears on the student's official transcript and diploma.

**Candidates for a bachelor's degree** may graduate "with distinction" provided they have completed 60 semester credits of coursework at Iowa State University at the time of graduation, including a minimum of 50 graded credits.

**Candidates for the bachelor of liberal studies degree** may graduate "with distinction" provided that they have (a) completed 45 semester credits of coursework at the three Iowa Regent universities at the time of graduation, and (b) earned at least a 3.50 cumulative grade point average at ISU. The graduation with distinction recognition will be based on their combined grade point average for coursework taken at the three Iowa Regent universities.

**Candidates for the bachelor of science in nursing degree** may graduate "with distinction" provided that they have completed 32 semester credits of coursework at ISU at the time of graduation.

**Honors Program.** Students who are full members of the University Honors Program prior to Fall Semester 2011 must have a cumulative grade point average of 3.35 or higher at the beginning of their final term. Students becoming full members during Fall Semester 2011 or later need a cumulative grade point average of 3.5 at the beginning of their final term. In addition to meeting the appropriate grade point requirement, students will have completed an approved honors program of study and an honors project prior to graduation. This recognition appears on the

student's permanent record and diploma, and in the commencement program.

## Graduation

Seniors must file a graduation application with the Graduation Office, 210 Enrollment Services Center. Students will be notified of their graduation status approximately mid semester of their graduation term. For graduation application instructions and deadlines, go to the Graduation and Commencement website (<http://www.graduation.iastate.edu/>).

Iowa State University commencement ceremonies are held at the end of fall and spring semesters. Undergraduate students expected to graduate at the end of summer semester are invited to participate in the spring ceremony preceding their graduation term or the fall ceremony following their graduation term. In addition to the formal University commencement ceremony, the undergraduate colleges host graduation activities take place at the end of fall and spring semesters. For more information see [www.registrar.iastate.edu/graduation/](http://www.registrar.iastate.edu/graduation/) (<http://www.registrar.iastate.edu/graduation/>).

Verification of satisfactory final grades will be completed approximately two weeks after the end of the semester and diplomas will be mailed to all successful degree candidates. Students must ensure the following before they can graduate:

1. The date of graduation is correct on the student's academic record.
2. Sufficient credits, acceptable toward graduation, have been earned to meet the minimum requirements for their curriculum. (Some examples of credit not acceptable toward graduation are: elective credits beyond those allowed in a curriculum, credits earned in passing the same course more than once, more than four credits of Athletics 101, and credit in two courses for which the catalog states that only one may count toward graduation.)
3. They have achieved a set of communication competencies established by the department as appropriate for the major.
4. A cumulative grade point average of at least 2.00 was earned in all work taken at Iowa State; and student has met all special grade point average requirements established by their college, department, or program in specified courses.
5. Students who have taken work at another college or university prior to or after having been a student at Iowa State, must have submitted a transcript of all such college study attempted to the Office of Admissions. Failure to submit such a transcript is grounds for dismissal.
6. Incompletes in courses required for graduation have been removed by midterm of the term of graduation.
7. At least 32 credits have been earned in residence at Iowa State University, and the final 32 credits were taken at Iowa State. (Six of the last 32 credits may be transferred to Iowa State, with prior



permission of their major department.) Iowa State University must receive an official transcript of all transfer work by midterm of the term of graduation.

8. Outstanding financial obligations owed the university have been paid in full. Students who owe an outstanding obligation to the university will have a hold placed on their records and they will not receive their transcripts. If students have questions about this policy, they should contact the graduation area of the Office of the Registrar.

## Posthumous Degrees and Certificates of Attendance

To provide survivors of deceased students with a meaningful acknowledgement of the student's accomplishments and legacy at Iowa State University, the University may grant degrees or certificates of attendance posthumously.

Consideration for a posthumous degree or certificate of attendance may be initiated by student's department/graduate program, by the Office of Student Assistance and Outreach, or by family members or other survivors. The student's death should be reasonably proximate to their enrollment at Iowa State; special consideration should be granted for circumstances such as departure due to military deployment or critical illness or injury.

For undergraduate and professional students, the student's College may recommend conferral of the posthumous degree or certificate of attendance, which will be forwarded to the Provost for consideration and a final decision.

For graduate students, their department or interdepartmental graduate program may recommend conferral of the posthumous degree or certificate of attendance to the Graduate College. The Graduate College will review the request with the disciplinary college of the student and forward the request to the Provost for consideration and a final decision.

After a request is approved, the University can issue the diploma or certificate of attendance to the survivors of the deceased student. The student's permanent record, and the commencement program, will indicate the degree was conferred posthumously, but no notation that the degree was awarded posthumously will be made on the diploma.

# Academic Conduct

## Class Attendance

In order to attend a given class, a student must be registered for that class for credit or audit. Exceptions to this policy are at the discretion of the instructor of the course. See Validating Enrollment for regulations concerning attendance to validate students' enrollment in a class.

Students are expected to attend class meetings as scheduled. Each instructor sets their policy with respect to class attendance, and excuses for absence from class are handled between the student and instructor.

The instructor is expected to announce their policy at the beginning of the course.

Additional information regarding discretionary accommodation for disability and religion are available at <https://www.eoc.iastate.edu/how-we-can-help/religious/> and <https://www.eoc.iastate.edu/how-we-can-help/disability-accommodations/>.

## Veteran Attendance

Students who receive benefits from the Veterans Administration are required by the V.A. to attend class regularly to maintain their V.A. eligibility. If the instructor knows that a student receiving V.A. benefits is not attending class, the instructor is obligated to notify the Office of the Registrar and a notification will be forwarded to the Veterans Administration. More information about veteran benefits is available at <http://www.veterans.iastate.edu/>.

## Field Trips/Curricular-Related Activities

Trips away from campus as part of a course are often appropriate educational experiences. They may not, however, take place during the first or last week of the semester, nor may they extend over more than two consecutive class days (Monday -Friday); these regulations may be waived only by special permission of the dean of the college in which the course is offered. Students should consult with instructors whose classes will be missed. If a mutually satisfactory agreement between the instructors and the student cannot be reached, the student cannot be required to attend the curricular-related activity or be penalized by the instructor for missing the curricular-related activity.

Special fees are often charged to cover the costs of field trips. Field trip fees are noted in the Schedule of Classes (<http://classes.iastate.edu/>).

## Excusable Absences for Non-Curricular Reasons

Students who miss class for non-curricular reasons are responsible for completing all assigned course requirements in a timely manner. Instructors should provide timely opportunities for students to make-up or replace missed scheduled examinations and/or assignments resulting from an excusable absence. While instructors are free to change the format of make-up examinations or assignments, students will be evaluated by the same standards as other members of the class.

In all cases, the person responsible for the event or activity should provide participants with a letter explaining the proposed absence and its duration including travel times for off-campus events and activities. Students must provide this documentation to instructors at least 10 days in advance of the activity or event, except when such notice is not possible.

Course instructors retain final authority regarding student absences and how they impact course grades and the acceptability of a student's work toward passing their course. If a student must miss, for any reason, a portion of a course that, in the considered opinion of the course instructor, is critical to the student's ability to meet the course objectives, the instructor must recommend alternative actions to the student, which may include dropping the class.

## Extra-Curricular Activities as a Representative of the University

Students may seek to or be asked to participate as an Iowa State University representative in non-credit events (competitions, conferences, presentations, programs, and performances) scheduled by academic or athletic units of the university at times that conflict with scheduled classes.

Instructors shall excuse students who miss class while representing Iowa State University in official department-or university-sponsored activities, including:

- academic or professional conferences and workshops
- intercollegiate athletic, academic, and judging competitions
- musical, theatrical, dance and other artistic performances
- presentations or programs given to external audiences

## Other Extra-Curricular Activities

Instructors will determine whether other absences not officially sponsored by a unit of the University (e.g., conference attendance, job interviews), will be treated as excused.

## Military Service

Instructors shall excuse absences due to Veteran or military service obligations (including service-related medical appointments, military orders dictating appointments, and National Guard Service obligations). When a student's military or veteran obligations are for more than two weeks, the student should meet with their advisor to discuss the situation and academic options and work with their instructors to discuss potential accommodations. University procedures are in place for such situations and should be followed. In all instances, students have a responsibility to communicate with their instructors to ensure they are continuing to meet course expectations and requirements. Faculty, staff, and students are encouraged to utilize the Military-Affiliated Student Center and review information at [veterans.iastate.edu](https://www.veterans.iastate.edu) (<https://www.veterans.iastate.edu/>).

## Court Appearances

Instructors shall excuse absences due to officially mandated court appearances including jury duty.

## Academic MISCONDUCT

Academic misconduct is any action or attempted action that may result in creating an unfair academic advantage for oneself or an unfair academic advantage or disadvantage for any other member or members of the academic community. Such behavior is disparaging to the university and students found responsible for academic misconduct can face a number of disciplinary sanctions such as a disciplinary reprimand, conduct probation, deferred suspension, suspension, or expulsion. Instances of academic misconduct ultimately affect all students and the entire university community by degrading the value of degrees when some are obtained dishonestly, and by impacting the grades of students working honestly.

Examples of academic misconduct include, but are not limited to the following:

1. **Obtaining or use of unauthorized information:** It is a violation to obtain or use unauthorized assistance or prohibited materials and texts, tools, or study aids, unapproved use of cell phones, internet, or other electronic devices, unauthorized collaboration or copying on a test or assignment. Other examples may include working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, looking at your notes or other work during an examination when not specifically permitted to do so, unauthorized sharing of questions or answers with another student or students whether in the classroom, via group chat or messages or another internet platform, or where posted by another student at an online academic warehouse (Course Hero, Chegg, Study Blue, etc.).
2. **Misrepresentation, falsification or fabrication of information.** It is a violation for students to misrepresent or falsify coursework. Examples of this may include purchasing or downloading for use a paper from a term paper service or online academic warehouse, working jointly on a project and then submitting it as one's own, requesting, hiring, or otherwise encouraging someone to take a course, exam, test, or complete assignments on your behalf or for another student.

Students may not engage in or submit falsified or fabricated course work such as falsifying research, inventing or falsely altering data, citing fictitious references, falsely recording or reporting attendance, hours, or engagement in activities such as internships, externships, field experiences, clinical activities.

It is additionally a violation for students to tamper with or attempt to alter grades, academic records, or an instructor's evaluation of work by altering materials or documents, tampering with evaluation tools, or other means of interfering.

3. **Plagiarism:** Plagiarism is a form of misrepresentation. Students may not present the work, words, theories, data, expressed ideas, or artistry of another person or persons as their own, neither word-for-word nor paraphrasing of another person's work. It is a violation for students to reproduce another person's paper, work or artistry, even with modifications, and submit it as their own. Students may not use another person's work or words (including unpublished material) without appropriate source documentation or citation.

It is a violation for students to submit substantially the same work to satisfy requirements for one course or academic requirement that has been submitted in satisfaction of requirements for another course or academic requirement without permission of the instructor of the course for which the work is being submitted.

4. **Other academic misconduct:** Students are prohibited from any action that helps another student engage in academic misconduct. Examples may include providing or selling coursework or materials to another person where this is not permitted or where they plan to use it in an unauthorized manner or otherwise submit it as their own work; unauthorized provision or discussion of exam questions or answers with students that will be taking the same or similar exam; posting coursework created by an instructor without their permission at an online academic warehouse (Course Hero, Chegg, Quizlet, etc.); taking an exam/completing an assignment for someone else; or otherwise seeking to acquire, selling, bribing, paying or accepting payment for unauthorized academic work or assistance that contributes to academic misconduct.

Students are prohibited from the recording and/or sale or dissemination (including posting) of instructional content without the express permission of the instructor(s) or through an approved accommodation coordinated via Student Accessibility Services.

Students, faculty, and staff who would like more information are encouraged to visit the Student Conduct (<https://www.studentconduct.dso.iastate.edu/>) website for resources pertaining to academic integrity.

## Reporting Academic Misconduct and Academic Outcomes

Academic misconduct is a violation of the behavior expected of a student in an academic setting as well as a student conduct violation. A student found responsible for academic misconduct is subject to appropriate academic penalty, to be determined by the instructor of the course, as well as sanctions under the university Student Code of Conduct (<https://www.policy.iastate.edu/policy/SDR/>). If an instructor believes that a student has behaved dishonestly in a course, the following steps **are recommended**:

1. Contact the student to indicate there are concerns with the coursework; this can be done via email or another appropriate student learning platform.
2. Provide the student an opportunity to respond and indicate whether they admit or deny responsibility.
  - a. Where students request to meet, instructors can facilitate this as plausible (in-person or virtual), involving the relevant and appropriate instructors for the referral (e.g., teaching assistant for the course and/or supervising faculty.)
  - b. In cases involving multiple students, it is recommended that meetings are with individuals.
3. If they **deny** responsibility, do not assign a grade for the assignment or course (leave grade as **N for grade processing**) until the Office of Student Conduct has shared the student disciplinary conclusions.
4. If they **admit** the misconduct, you may **assign a grade** according to your discretion and what you may have outlined in your syllabus.
5. Refer the case and information to the Office of Student Conduct via their website reporting form, including related materials such as exams, coursework, reports, websites, external resources, syllabi, summary of the interaction with student(s), and other relevant information, as requested.

In cases involving denial of responsibility, when an outcome is determined by the Office of Student Conduct, both the student and the instructor will be notified of the disciplinary process conclusions.

For questions regarding the process, contact the Office of Student Conduct.

The complete Student Code of Conduct policy and process pertaining to academic misconduct can be found at <https://www.policy.iastate.edu/policy/SDR/> (<https://www.policy.iastate.edu/policy/SDR/>).

## Response to Classroom Disruption

Should any student officially enrolled for credit or audit in a class disrupt the instructor's ability to ensure a safe learning environment, control the class agenda, and/or deliver the approved curriculum, the instructor has the right to ask that the disruptive action cease immediately. The instructor may find it useful to include general guidelines about disruptive behavior on the course syllabus; and in the event of a classroom or learning environment disruption, the instructor may, if they find it necessary, explain to the student and the class why the particular action is deemed disruptive. The responsible student should cease the disruption and utilize non-disruptive means for expressing disagreement or concern. If the disruption continues, the instructor can pursue various forms of intervention as discussed in more detail in the Faculty Handbook. (<http://www.provost.iastate.edu/>)

Additional guidance and resources for managing classroom disruption are available from CELT (<https://www.celt.iastate.edu/teaching/effective-teaching-practices/classroom-behavior/>).

## Course Ownership

### Ownership of Course-related Presentations

The presenter owns course-related presentations, including lectures. Individuals may take written notes or make other recordings of the presentations for educational purposes, but specific written permission to sell or post the notes or recordings for sale or subscription must be obtained from the presenter. Selling notes by students without the required permission is a violation of the Student Conduct Code (<https://www.policy.iastate.edu/policy/SDR/#4225>).

### Recording and Transmission of Classes

Recordings and transmission of classes may take place for a variety of legitimate reasons, including providing educational opportunities for those who cannot attend classes on campus, assisting students with disabilities that impair classroom note taking, and giving the instructor feedback on their classroom performance.

Because the lectures of faculty represent their intellectual labors, individuals are expected to obtain permission to make recordings of lectures and other classroom interactions. Recordings may be used for the purposes of the particular class, although in some cases, and with permission of faculty, the recordings may be preserved and used for other classes as well.

## Grading

### GRADING SYSTEM

Grades represent the permanent official record of a student's academic performance. The grading system at Iowa State University operates according to regulations outlined on the Grade Policies tab. The following provides quality points assigned for each letter grades:

Grade	Quality Points
A	4.00
A-	3.67
B+	3.33
B	3.00
B-	2.67
C+	2.33
C	2.00
C-	1.67
D+	1.33
D	1.00

D-	0.67
F	0.00
Grade	Description
P	Passing mark obtained under the Pass-Not Pass system.*
NP	Non-passing mark obtained under the Pass-Not Pass system.*
S	Satisfactory completion of a course offered on a Satisfactory-Fail grading basis. May also be reported to indicate satisfactory performance in R (required-credit) courses, and in courses numbered 290, 490, 590, and 690.
T	Satisfactory performance (equivalent to a grade of C or better in courses numbered 100-499, and a grade of B or better in courses numbered 500-699) in a special examination for academic credit.
X	The course was officially dropped by the student after the first week of the term.
N	No report was submitted by the instructor. An N is not a recognized grade or mark, it merely indicates the instructor has not submitted a grade and that a grade report has been requested. A nonreport (N) will automatically change to a grade of 'F' after one calendar year whether or not the undergraduate student enrolled during that period. If the N is outstanding at the time of graduation, it will be converted to a grade of 'F'. Undergraduate students will not graduate with N on their permanent record. Repeating a course will not resolve the N.

I Incomplete. An incomplete mark may be assigned when the student is passing at the time of the request, but special circumstances beyond the student's control prevent completion of the course. In general, failing the final exam or project or not submitting course work as a result of inadequate preparation or learning are not valid excuses.\*\*\*

\*See Pass Not Pass Grading.

\*\*\*See Incomplete Marks in the Grade Policies tab.

## POLICY INFORMATION

Grades represent the permanent official record of a student's academic performance. The grading system at Iowa State operates according to the following regulations:

**1. Student performance or status** is recorded by the grades and marks described below. A student's grade point average is calculated on the basis of credits earned at Iowa State with the grades and quality points shown below. Credits earned with P, S, or T are not used in calculating the grade point average but may be applied toward meeting degree requirements. A cumulative grade point average of 2.00 is required for a bachelor's degree.

**2. Students who want to protest a grade submitted by an instructor** should follow the procedures described in the section, Academic Grievances and Appeals.

**3. Incomplete Marks** - If the instructor and student agree that an Incomplete is appropriate, they should complete an Incomplete (I) Contract (downloadable from the Office of the Registrar forms (<http://www.registrar.iastate.edu/forms/>) website) to document the reason for the I, the requirements for resolving it, and the date by which it must be resolved, not to exceed one calendar year or the student's graduation term (whichever is earlier). If the student is not available to sign the Incomplete (I) Contract, the instructor must document the conditions for the Incomplete by communicating directly with the student by e-mail or postal mail. A copy of this communication must be retained by the instructor until after the I is resolved in case there are any questions in the future regarding the terms of the Incomplete. The instructor also needs to enter the Incomplete (I) electronically as part of the end of term final grade submission.

Resolving an Incomplete: When a student completes the requirements specified on the Incomplete Contract, the instructor submits the appropriate grade, which becomes part of the student's

cumulative, but not term, grade-point average. The grade does not replace the I on the record. The I remains on the record for the applicable term.

A final course grade, once submitted to the registrar, **may not** be changed to an Incomplete except to correct an error at the request of the instructor, and with the approval of the instructor's department head and the dean of the instructor's college. The Incomplete (I) Contract should be used by the instructor to document the conditions for the Incomplete as specified above. The Grade Report to the Registrar form should be used to initiate the request to change the grade to an Incomplete. The Grade Report form should be completed and forwarded by the instructor to his/her Dean for approval. The Dean will forward the Grade Report form to the Office of the Registrar if approved.

Incompletes in all courses must be resolved by the middle of the student's term of graduation. Repeating a course will not resolve an I mark. A mark of I will automatically change to a grade of F after one calendar year (whether or not the student was enrolled during the period).

**4. To change a grade or mark** already reported to the registrar, the instructor submits the Grade Report to the Registrar form. This form is used for resolving an I with a grade, for correcting an instructor error, or for the late report of a grade.

**5. Midterm Grades.** The registrar will collect C-, D+, D, D- and F midterm grades and nonattendance notifications from the instructor and report this information to students and their advisors using AccessPlus. In addition to submitting the midterm grades, the instructor is responsible for informing the class of the basis on which they were calculated.

The purpose of midterm grades is to provide the student and advisor with a timely warning that the student's academic performance to that point in the course may be lower than desirable. Students who receive midterms are encouraged to discuss their academic performance with the course instructor and their advisor.

**6. Grades in all courses attempted** remain on each student's record. If a course is repeated, the record will show the grade obtained on the initial attempt as well as grades received on subsequent attempts.

**7. The cumulative grade point average** is calculated by dividing the total number of quality points earned by the total number of credits in all courses attempted. Grades of S, P, NP, and T are not counted in calculating the grade point average.

**8. Repeating Courses.**



- The most recent grade for a course a student repeats will be used to compute the student's cumulative grade point average rather than the previous grade(s), up to a limit of 18 credits. (This could result in a lowered grade point average if the second grade is lower than the first, or even loss of credit if the grade is lowered to an F). All grades will remain on the student's record.
  - Students may repeat any course for which an F grade, an NP grade, or any passing grade was received. A course initially taken for a grade must be repeated as a graded course. A course initially taken as Pass/Not Pass may be repeated as a graded or Pass/Not Pass course.
  - Beyond the 18 credit limit of repeats, all grades will be included in computing the cumulative grade point average. Please refer to items #1 and #7 above regarding how to calculate the grade point average.
  - Courses should be repeated as soon as possible, preferably within three semesters in residence, because of changes that occur with course updating, change in course number, or revision in the number of credits.
  - Approval to repeat a course in which the course number or number of credits has changed must be noted on a Designation of Repeated Course form, which can be obtained from departmental offices. This form must be signed by the head of the department offering the course and by the student's advisor, and then taken to the Office of the Registrar. Deadlines for filing repeated course forms for full-semester and half-semester courses are published in the university calendar.
  - Transfer students may repeat courses at Iowa State University for which a D or F was received at another institution. They must process a Designated Repeat Form. Such repeated credits will count toward the 18-credit request limit.
  - A student who has earned an F at Iowa State University may repeat the course at another institution and the credits earned may be applied toward graduation at Iowa State, but the grade earned will not be used in computing a cumulative grade point average.
  - Repeated courses may affect any federal financial aid. See the Financial Aid website (<http://www.financialaid.iastate.edu/>) for further information.
- student must obtain approval from their academic advisor and college dean.
2. Only elective courses may be taken on a P-NP basis. In specific majors, some restrictions may apply, so students should consult with their academic advisor.
  3. Except for restrictions on its own undergraduate majors, a department may not deny the availability of any of its course offerings on a P-NP basis.
  4. Courses offered on a satisfactory-fail basis may not be taken P-NP.
  5. Students should register for a P-NP course in the same manner and at the same time that they register for their other courses. Students should then change to P-NP by processing a schedule change form with their academic advisor's signature in the P-NP approval section of the form.
  6. Students who elect to change back to a graded basis should process the change using the P-NP section of the schedule change form.
  7. Changes to or from a P-NP basis may not be done after the last day to drop (usually the Friday of week 10 of the term) without college approval. Changes from a P-NP basis to a Graded basis that occur after the last day to drop will still count against a student's 9 maximum allowable P-NP credits.
  8. Registration on a P-NP basis is not indicated on the instructor's class list. Students will receive a P if their grade is D minus or better and an NP if their grade was F.
  9. Neither P (earned grade of D minus or better) nor NP (earned grade of F) is counted in calculating a student's grade point average (GPA).
  10. When students change their curriculum, any P credits that they have accumulated will be accepted by the new department if such credits are in courses normally accepted by the department.
  11. Credits taken on a P-NP basis at another institution and transferred to Iowa State may be applied as electives in a student's degree program if the credits are otherwise acceptable in that program. The number of P-NP transfer credits that can be accepted depends on the number permitted by the institution from which the student is transferring. If a student transfers more than nine semester P-NP credits, no additional Iowa State P-NP credits can be applied to the student's degree program.

## PASS-NOT PASS GRADING

Students may choose to attempt a maximum of 9 semester credit hours on a Pass-Not Pass basis, meaning that only a P or NP will be recorded as their final grade in the course. The purpose of P-NP grading is to encourage students to broaden their education by taking courses outside the usual program of study for their major and minor disciplines. The following policies apply:

1. Undergraduate students who are not on academic probation (P) at the beginning of the semester are eligible. A special (nondegree)

## EXAMINATIONS

Examinations are one of the most common ways instructors assess student performance. In order that examinations can be a useful part of the educational process, the following policies have been instituted:

1. One purpose of examinations is to help students' learning. Therefore, examinations should be evaluated as soon as possible after they are given and the results should be made available to the students in a timely way to enhance learning.



2. All tests and examinations administered between the beginning of the term and final examination week shall be held during a regularly scheduled lecture or laboratory class period for that course.

A department may obtain approval to administer a separately scheduled examination if all of the following criteria are met:

- a. The course is multi-sectioned.
- b. A common departmentally developed examination will be administered to all students in all sections at the same time.
- c. The test scores will be used as a basis for a uniform grading procedure for all sections of the course. Requests to hold separately scheduled examinations must be made to the registrar and approved by the provost in time to be announced in the Schedule of Classes to allow students to plan in advance. Only under unusual circumstances will a course be approved for separately scheduled examinations if the deadline is past to include notification in the Schedule of Classes. Whenever a separately scheduled examination is administered, a regular class meeting during that week shall be omitted.

Students who are unable to take a separately scheduled examination at the scheduled time indicated in the Schedule of Classes, because of a course conflict or other legitimate reason must notify the instructor in advance and must be given the opportunity to be examined at another time mutually convenient for the student and the instructor. The instructor shall determine whether to administer the same examination or an alternate examination, or use an alternate assessment procedure.

3. At the end of the semester, a week is set aside for final examinations or other term evaluations, with a two-hour period normally scheduled for each course. The following policies govern the responsibilities of students and faculty members during this week:

- a. Final exams may not be given at a time other than that for which the exam is scheduled by the registrar. An instructor may not give a final exam prior to final exam week nor change the time of offering of the final examination as it appears in the final exam schedule. Permission to change the time for which an exam is scheduled may be given only by the dean of the college. If the instructor elects not to give a final exam in a course of two or more credits, the class is required to meet at the scheduled final exam period for other educational activity such as a review of the course or feedback on previous exams.
- b. Final exam periods are determined according to the regularly scheduled meeting time of the class. However, certain courses are assigned special group exam times so that several sections of the same course may be tested together. The criteria for establishing special group exams are similar to those listed for separately scheduled exams listed in number 2 above. If this results in conflicting group examination periods, students should inform the instructor in charge of the first of the two conflicting

courses as listed on the final exam schedule within the special groups in question; that instructor is responsible for arranging a special examination or making some other adjustment.

- c. Evening courses with lectures scheduled at 6:00 p.m. or later should give their examinations during finals week from 7:00-9:00 p.m. on the day the class normally meets. If this exam conflicts with an evening group exam, the instructor responsible for the latter must arrange a special examination for any students who have a conflict.
- d. If unusual circumstances involve the need for students to change the time of their final examination, they must obtain the approval of the instructor of the course.
- e. If a student has three examinations scheduled on the same calendar day and wishes to change one to another day, the instructor of the course having the smallest number of students is responsible for arranging an alternate examination time for the student unless make-up exam times are available in one of the other courses.
- f. All faculty members and teaching assistants with instructional or grading responsibilities are considered to be on duty throughout the entire final examination week and are expected to be available to students during that week for discussion of any matters pertaining to the final examination and final grade or to other aspects of the course.

## Prep Week

For each Fall and Spring semester, the last full week of classes before final examinations is designated as Prep Week. The intent of this policy is to establish a one-week period of substantial and predictable study time for undergraduate students. During the Prep Week period, regular lectures are expected to continue, including the introduction of new content, as deemed appropriate by the instructor. The restrictions established by this Prep Week policy are:

- Due dates for mandatory graded submissions of any kind that fall within Prep Week must be listed on the syllabus provided at the start of the course.
- Mandatory final examinations may not be given during the Prep Week period except for laboratory courses or courses that meet weekly and for which there is no contact during the normal final examination week.
- No in-class quizzes or exams may be given on the Thursday and Friday of Prep Week. Quizzes/exams that are administered outside of class such as take-home exams, online exams, or exams given in the testing centers must: 1) open no later than Wednesday at noon of Prep Week, and 2) only cover material presented on or before the Tuesday of Prep Week.

Exceptions to this policy include the following:

- Classes that only meet on Thursdays or Fridays
- Lab components of courses
- Half-semester courses
- Make-up exams due to excused absences
- Regularly used formative assessments intended to enhance student engagement and guide course delivery

All other exceptions require approval by the Office of the Senior Vice President and Provost.

- Registered ISU Student Organizations may not hold any meetings, functions, or sponsored events during the Prep Week period. Any exception to these restrictions must be authorized in advance by the Office of the Senior Vice President for Student Affairs.

Instructors are reminded that most students are enrolled in several courses each semester, and the widespread violation of this policy can cause student workloads to be excessive as students begin their preparation for final examinations.

Students are reminded that their academic curriculum is their principal reason for being in college and they have a responsibility to study in a timely fashion throughout the entire semester.

*Policy approved by Faculty Senate, Senior Vice President and Provost, and President, 2013; Amended and approved by Faculty Senate, Senior Vice President and Provost, and President, 2017.*

## SCHOLASTIC RECOGNITION

The university recognizes those students who are doing exceptionally well in several ways, including the following.

**1. Dean's List.** Each semester the university issues a dean's list made up of those students who have carried at least 12 credit hours of graded or S-F courses with a 3.50 grade-point average or above for the semester. Courses taken on a P-NP basis do not count as part of the 12-credit hour requirement. No dean's list is issued for summer school. The list can be viewed from the Office of the Registrar website (<http://www.registrar.iastate.edu>).

**2. Top 2 Percent.** Each spring semester, undergraduate students in the top 2% of their class (freshman, sophomore, junior, and senior) within their college, based on cumulative grade point average, are recognized. In addition to a congratulatory letter from the university president, a notation of the accomplishment is recorded on the student's permanent record.

**3. Graduation with Distinction.** Undergraduates who have a cumulative grade point average of 3.50 or higher (based on a 4.0 scale) are eligible to graduate "with distinction" provided they have completed the following

criteria for their degree. The student's distinction will be based upon their cumulative grade point average after all degree requirements have been satisfied.

These students are recognized as follows:

- Summa Cum Laude: cumulative grade point average of 3.90 or higher.
- Magna Cum Laude: cumulative grade point average of 3.70 to 3.89.
- Cum Laude: cumulative grade point average of 3.50 to 3.69.

The recognition appears on the student's official transcript and diploma.

**Candidates for a bachelor's degree** may graduate "with distinction" provided they have completed 60 semester credits of coursework at Iowa State University at the time of graduation, including a minimum of 50 graded credits.

**Candidates for the bachelor of liberal studies degree** may be graduated with distinction provided they (a) have completed 45 semester credits of coursework at the three Iowa Regent universities at the time of graduation, (b) have earned at least a 3.50 cumulative grade point average at ISU, and (c) their combined grade point average for coursework taken at the three Iowa Regent universities meets the honors cutoff specified above.

**Candidates for the bachelor of science in nursing degree** may graduate "with distinction" provided they (a) have completed 32 semester credits of coursework at ISU at the time of graduation, and (b) have earned the appropriate grade point requirement as outlined above.

**Honors Program.** Students who are full members of the University Honors Program need a cumulative grade point average of 3.50 at the beginning of their final term. In addition to meeting the appropriate grade point requirement, students will have completed an approved honors program of study and an honors project prior to graduation. This recognition appears on the student's permanent record, diploma, and in the commencement program.

## EVALUATION PROCEDURES

It is university policy that the instructor shall inform the students at the beginning of each course of the evaluation procedures planned for use in the course.

## RETENTION OF RECORDS

Records of all graded work must be retained by the instructors until midterm of the semester following completion of a course or until all pending appeals and incompletes are resolved, whichever is later. Instructors leaving the university must file records of all graded work with their department office before departure.

# Academic Standing

## Academic Standards Regulations

Each college has an academic standards committee that is responsible for monitoring the academic progress of all undergraduate students in that college, based on policies and minimum requirements set by the Faculty Senate Committee on Academic Standards and Admissions and ratified by the Faculty Senate. Individual college faculties may, with the approval of the Faculty Senate Committee on Academic Standards and Admissions, set additional program admission and curriculum requirements that are more stringent than those established for the university. These additional requirements must be reviewed at least every third catalog by the college academic standards committee to determine if the requirements should be continued. Requirements approved by the college academic standards committees will then be forwarded to the Faculty Senate Committee on Academic Standards and Admissions for final approval. The college committees are responsible for actions involving individual students with respect to placing students on Academic Probation, dismissing students from the university for unsatisfactory academic progress, and reinstating student who have been Academically Dismissed.

**Changing colleges:** A student on Academic Probation may transfer to another program in the university before period 3 begins (before the last day to drop a course.) For students on Academic Probation, transfer during period 3 (after the last day to drop a course) can only occur under exceptional circumstances and with the approval of the chair of the new program and the dean of the new college.

**Withdrawal:** A student on Academic Probation who withdraws during period 3 will be Academically Dismissed at the end of the term the student withdraws, except under extenuating circumstances as judged by the college academic standards committee.

**Reinstated students:** Reinstated students should also see the section on Reinstatement.

**Veterinary Medicine:** Additional rules for minimum satisfactory progress are in effect.

**Special (nondegree) students:** Students matriculated in this classification category are governed by the regular academic progress regulations. Furthermore, by special action of their college academic standards committee, additional standards may be required.

## Academic Progress

For questions concerning interpretation and application of the rules governing academic progress, students should contact the chair or secretary of their college academic standards committee in their college office.

The university's academic standards rules are presented below. In addition to taking action based on these rules, a college academic standards committee may also place a student on academic probation or dismiss a student from enrollment in the university when, in the college committee's judgment, the student's academic performance or progress toward a degree is exceptionally deficient. Likewise, a college committee may, under exceptional circumstances, exempt individual students from the application of these rules. Students who participate in the Regent Universities Student Exchange Program, or in a similar program where the credit taken at the other school will be considered as resident credit and the grades included in the student's ISU cumulative grade point average, are subject to Iowa State University's academic standards.

## Maintaining Satisfactory Progress

Continued enrollment at Iowa State University depends upon an undergraduate student maintaining satisfactory academic progress toward attaining a degree. To assist students in maintaining satisfactory progress, Iowa State University has adopted academic standards designed to provide early identification of students who are experiencing academic difficulty, and to provide timely intervention through academic advising and academic support programs.

Academic standing at Iowa State University is dependent upon the total number of credits a student has attempted or earned, the student's semester grade point average (GPA), and the student's cumulative ISU GPA.

## Academic Warning

While Academic Warning is the least severe of the negative academic standings, it serves as a reminder that future academic performance below 2.00 could result in more serious consequences. In fact, a student on Academic Warning whose subsequent term GPA is below a 2.00 will be placed on Academic Probation the following term.

Students who receive an Academic Warning are required to develop a plan for academic improvement in consultation with their academic advisor or the Academic Success Center. A student who is subject to both Academic Warning and Academic Probation will be placed on Academic Probation. The Academic Warning is not a part of the student's permanent academic record.

Students will receive an Academic Warning at the end of any fall or spring semester when they earn a GPA of 1.00 – 1.99 for that semester. At the end of the next fall or spring semester of enrollment, one of the following actions will be taken for students on Academic Warning:

- Students will be placed on Academic Probation if they earn less than a 2.00 GPA for the next fall or spring semester, or
- They will be removed from Academic Warning if they earn at least a 2.00 semester GPA for the next fall or spring semester and they are

not subject to Academic Probation based on cumulative GPA (over 75 credits).

See Summer Academic Standards Regulations section for how summer grades affect Academic Warning, Academic Probation, and Academic Dismissal.

## Academic Probation

Students are placed on Academic Probation as a warning that their academic progress is not satisfactory and that they should take steps to improve their academic performance to avoid Academic Dismissal from the university. Academic Probation is an indication of very serious academic difficulty. Students may be placed on Academic Probation as a result of either semester GPA, cumulative GPA, or both. Academic Probation status is not a part of the student's permanent academic record.

Students on Academic Probation and Academic Warning are required to meet with their advisor and to complete the Academic Intervention Self Assessment form, which can be accessed here: <http://www.dso.iastate.edu/asc/ai/students/>

Students will be placed on Academic Probation at the end of a semester/term for either of the following two reasons:

1. Semester GPA: Students who earn less than a 1.00 at the end of any fall or spring semester, or less than a 2.00 two consecutive semesters, will be placed on Academic Probation. Students will not be placed on Academic Probation at the end of the summer term due to summer term GPA only.
2. Cumulative GPA: Students with 75 or more credits attempted or earned, whichever is greater, will be placed on Academic Probation at the end of any fall or spring semester or summer term when their cumulative GPA is less than 2.00.

At the end of the next fall or spring semester of enrollment, one of the following actions will be taken for students on Academic Probation:

- Students will be academically dismissed if they fail to earn at least a 2.00 semester GPA.
- Students will continue on Academic Probation if they earn at least a 2.00 semester GPA but are subject to continued Academic Probation based on their cumulative GPA (over 75 credits).
- Students will be removed from Academic Probation if they earn at least a 2.00 semester GPA and are not subject to continued Academic Probation based on their cumulative GPA (over 75 credits).

See Academic Dismissal for dismissal policy.

See Summer Academic Standards Regulations section for how summer grades affect warning, probation, or dismissal status.

## Academic Dismissal

Students who do not meet the requirements of their Academic Probation are Academically Dismissed from the university. Each College Academic Standards Committee is responsible for final decisions regarding the academic status of students in that college, and any appeals to Academic Dismissal are considered by the college committee. Once a student has been Academically Dismissed, they are not allowed to re-enroll at Iowa State University until they have been Academically Reinstated. (See section on Reinstatement.) Academic Dismissal is placed on the student's academic record as a permanent notation. The official transcript of a student who has been Academically Dismissed includes a "Not Permitted to Register" notation.

## Summer Academic Standards Regulations

Students who are newly placed or continued on Academic Probation at the end of the previous semester may enroll for the summer term without being in jeopardy of Academic Dismissal from the university at the end of that summer term.

### Summer Combined Term GPA:

All students who attend summer session will have their academic status reassessed at the end of the summer based on the combined (not averaged) grade summaries of their previous graded term of attendance and summer term. Academic status (warning or probation) after summer session will be based on the resulting combined term GPA. The academic status resulting from the summer combined term GPA supersedes the academic status at the end of the previous term.

For students who have remaining designated repeat credits, courses taken in the previous semester and repeated in summer will be calculated as designated repeats in the combined term GPA.

The combined term GPA (summer plus preceding term) will not appear on the student's grade report or permanent record.

Summer term GPA alone cannot determine academic status. Students who initiate enrollment at Iowa State during the summer will not be placed on Academic Warning or Academic Probation regardless of their academic performance.

### Summer Cumulative GPA:

A student who was on Academic Probation at the beginning of summer term based only on cumulative GPA, who raises his or her cumulative GPA to over a 2.0 at the end of the summer term shall be removed from Academic Probation status at the end of the summer term.

A student with 75 or more credits attempted or earned, whichever is greater, will be placed on Academic Probation at the end of the summer term if his or her cumulative GPA is less than 2.00.

A student with 75 or more credits attempted or earned who has a transfer GPA less than 2.00 will be placed on Academic Probation at the end of any summer term if his or her combined transfer/ISU cumulative GPA is less than 2.00.

# REGISTRATION

## Registration/Enrollment

In order to register for classes students must first accept their offer of admission by the university. Registration and the payment of assessed fees are required of all who attend classes. Enrollment is not complete until fees are paid, including room and board fees for those living in residence halls.

Registration is a process by which students become officially enrolled in classes for a given term. The process involves consultation between the student and the student's academic advisor. All undergraduate students are assigned an academic advisor based on their major/curriculum. A new advisor assignment is made when a student changes majors/curricula.

Students who attend classes must complete registration and pay their assessed fees. Registration is not complete until all fees are paid, including board and room fees for those living in residence halls.

Students with disabilities who need assistance with any phase of registration should contact Student Accessibility Services.

## Validating Enrollment

To validate their enrollment in each course at the beginning of the semester, students must attend the first or second meeting (first meeting if the class meets only once a week). Students who add a course after the term begins must attend the next class meeting. The instructor has the option to offer a registered place in the course to another student when a registered student fails to attend and has not obtained prior approval of the instructor. Students who do not validate their enrollment must drop the course or they will receive an F grade.

## Enrollment Status

Enrollment status is defined for certification purposes as either full-time or half-time.

### Full-time status, fall or spring semester

Undergraduates: 12 credits

Graduates: 9 credits

Professional: 12 credits

### Three-quarter status, fall or spring semester

Undergraduates: 9 credits

Graduates: 7 credits

Professional: 9 credits

### Half-time status, fall or spring semester

Undergraduates: 6 credits

Graduates: 5 credits

Professional: 6 credits

### Full-time status, summer semester

Undergraduates: Summer status depends on the number of weeks a student is enrolled.

Graduates: Summer status depends on the number of weeks a student is enrolled.

Professional: 8 credits

Always contact the Office of the Registrar to verify a student's status for a summer session. Additional enrollment status information is available on the Office of the Registrar webpage (<https://www.registrar.iastate.edu/students/verification-proof-of-enrollment/fulltimestatus/>).

With the exception of enrollment certification for veterans' benefits, credit hours are rounded up to the next whole number. For example, credit load of 11.5 credits is rounded up to 12 credits. Contact the Office of the Registrar for more information.

## Registration Responsibilities

The registration process includes advising, enrollment in courses, and schedule changes. In addition to the student, this process may involve the student's advisor; the student services staff of the student's college; and the dean of the college. Each is responsible for knowing and following the academic policies and procedures.

### Student

- knowing and adhering to university policies and procedures that apply to registration and schedule changes
- checking the accuracy of his/her schedule on AccessPlus, including schedule adjustments (i.e., adds, drops, section changes)
- knowing the degree requirements of his or her major and/or curriculum
- planning course schedules to meet those requirements; and monitoring the accuracy of the degree audit.

### Advisor

- consulting with advisees during the advising/registration period
- providing information about student's major and curriculum requirements
- providing guidance in the student's course selection
- assisting in monitoring the degree audit for accuracy
- notifying the college student services office with corrections to the degree audit.

### College Student Services Staff

- assisting new and reentering students with the registration process
- resolving unusual scheduling problems
- updating the degree audit or solving problems concerning the degree audit.



## Dean

- making decisions with respect to requests for deviations from university policies, deadlines, etc.

Students and staff should check with the college office to find out who is authorized to grant approvals or exceptions on behalf of the dean.

## Class Schedule Planner

The Class Schedule Planner is an application that allows students to plan their schedules using courses displayed in the Schedule of Classes. Students can select courses and/or sections they want to take for a particular term, as well as block out unavailable class days and times. Based on those selections, Class Schedule Planner can return all possible schedules to the student in a color coded grid format.

Though it is a Web-based application, the Class Schedule Planner does not require authentication (no user ID, PIN, or password). Therefore, it is essential that students understand this is a planner and as such, it does not register them in courses and cannot be used to complete their registration. The application requires that the user have Java on their computer. The first screen of the Planner provides information about how to use the planner and simple instructions for downloading the Java application. A useful Help link also has been provided. The Class Schedule Planner is available at <http://classes.iastate.edu/planner> (<http://classes.iastate.edu/planner/>).

## Using AccessPlus Registration

Students enter the system via AccessPlus by using university ID and password. A registration access number (RAN) also is needed, if required by their college.

The registration system provides messages after each entry indicating whether each request has been processed. Students also may review their current schedules at any time during registration. Students are held accountable for all changes made to their schedules.

All students are encouraged to register for courses through the AccessPlus registration system. However, students who are unable to use the system may register in person by processing their signed Registration Worksheet in the Registrar's Student Scheduling Office, 10 Enrollment Services Center.

## Registration System Abuse

Using the AccessPlus registration system is a privilege, which may be revoked if abuse is detected. Abuse includes, but is not limited to, creating and using an automated program to search for course openings and/or enrolling in a section with the intent of reserving space in that particular section for another student. The Office of the Registrar, college office, and/or advisors have the right to determine abuse and revoke privileges for any type of registration system abuse.

## Registration Process

To register for classes, students need the following materials and information:

- Registration Worksheet, available for download at [www.registrar.iastate.edu/forms/](http://www.registrar.iastate.edu/forms/) (<http://www.registrar.iastate.edu/forms/>).
- A RAN (registration access number) if required by their college.
- Course information from the Online Schedule of Classes at <http://classes.iastate.edu/> (<http://classes.iastate.edu/>).
- Other departmental information applicable to their curriculum, available from their advisor.

Students are expected to do the following in the advising and registration process:

### 1. Meet with their advisor, who will provide the following:

- a. degree audit
- b. guidance in course selection
- c. Registration Authorization form, with RAN, if applicable.

**2. Choose specific sections of each course.** Students are responsible for choosing their course sections. In most cases advisors will not be involved in selecting meeting times.

**3. Review their registration start date/time information** and any registration hold information on AccessPlus (<https://accessplus.iastate.edu/frontdoor/login.jsp>), under Current Information. Students in those colleges which require a four-digit registration access number (RAN) should meet with their advisor in advance of their start date, to obtain their Registration Authorization Card on which the RAN is printed.

**4. Register for courses** using the AccessPlus (<https://accessplus.iastate.edu/frontdoor/login.jsp>) registration system.

## Making Schedule Changes

Students may make most schedule changes through the first five days of class using the AccessPlus (<https://accessplus.iastate.edu/frontdoor/login.jsp>) registration system. For courses with permission requirements and/or after the first week of classes, a Schedule Change form will be needed.

The Schedule Change form can be found in AccessPlus, under the Student tab, within *Registrar Forms* located in the menu on the left column.

Procedures for schedule changes vary by the time period of the semester. The effective date of a schedule change is the date when the change is entered into the registration system.

**Schedule change periods for full term courses are as follows:**

**Period 1 ends on the fifth day of classes in the fall and spring semesters.**

Schedule changes during period 1 do not require advisor signatures.

Instructor or departmental approval may be required for adds or section changes for some courses during period 1. Course drops during this period will not appear on a student's permanent academic record.

**Period 2 ends the Friday of week 10 in the fall and spring semesters.** It is important for students to make well-informed decisions when adjusting their course schedules, particularly because such decisions often have financial and/or academic implications. To best support students' decision-making process, period 2 schedule changes should be made in collaboration with their advisor and instructor as appropriate and necessary.

For students who wish to add or change sections of a course, or adjust course credit hours, the signatures grant permission for a student to make the requested change.

The decision to drop a course rests with the student; as such, the advisor's signature is not one of permission, but rather to indicate a conversation about the implications of dropping has occurred. Course drops after period 1 appear on the permanent academic record. A section change does not require a drop.

Drops and other schedule changes that are judged to be beyond the student's control may be processed as administrative actions if approved by the college dean. Administrative drops do not appear on the permanent academic record. The effective date of an administrative action is the date it is approved by the college dean or authorized representative.

**Period 3 is anytime after period 2.** Schedule changes during this period are permitted only for extenuating circumstances, may require a written statement of support from the instructor and the student, and must be approved by the dean of the student's college or authorized representative.

### **Half-Semester and Partial Term Courses**

Specific deadlines for adding and dropping half-semester courses are published in the university calendar. Prorated adjustments to add and drop deadlines are made for other partial term courses. To find out specific deadlines for partial term courses, contact the Registrar's Student Scheduling Office, 10 Enrollment Services Center, 294-2331.

### **R-Credit Courses (required courses)**

Processing a scheduling change for a required course is usually considered administrative. Administrative drops do not appear on the permanent academic record. To make a Period 3 R-credit drop administrative requires approval of the college dean.

## **Dates and Deadlines**

Dates for registration are published in the university calendar (<http://www.event.iastate.edu/>) (choose the Academic calendar link), and at [www.registrar.iastate.edu/calendar/](http://www.registrar.iastate.edu/calendar/) (<http://www.registrar.iastate.edu/calendar/>).

Students are assigned a registration start date and time, which is the first day and time they can use the registration system. Registration start dates are assigned based on projected year in school classification (computed by combining total credits, current term credits, and current term test out credits). Then specific start dates within projected year in school are established by using the sum of total credits and current term test out credits.

Students may choose to delay their registration until a later date; however, courses will begin to fill on the first day of registration. Any delay in registration may reduce course selection options. A list of start dates by classification is available at <http://www.registrar.iastate.edu/calendar/registration-start-dates> (<http://www.registrar.iastate.edu/calendar/registration-start-dates/>).

Continuing students register for the following term during the middle of the current term. For example, registration for spring term begins the middle of fall term; registration for summer session is completed during the previous spring at the same time as registration for fall semester.

A late registration fee is assessed for registration initiated on or after the first day of classes for fall and spring terms. This fee is not charged for the summer term. If registration is not initiated by the end of the fifth day of classes, students must obtain written permission from their advisors, the instructors for the courses they plan to take, as well as approval from the dean of the college in which they are registered. During the summer session, these approvals must be obtained in order to register after the third day of classes.

Students may not enroll in courses with time conflicts without the approval of the instructors concerned.

Students who participate in off-campus experiences for which they receive Iowa State University credit must register for that credit during the term when the experience is taking place, whether or not they are taking courses on campus during that time.

## **Withdrawal of Admission to the University**

New undergraduate students who wish to withdraw their admission to the university prior to the first day of classes must initiate their withdrawal by completing the Admissions Office's Application Change Form: [https://www.admissions.iastate.edu/forms/change\\_application.php](https://www.admissions.iastate.edu/forms/change_application.php).

## Cancellation/Withdrawal - Currently Enrolled Students

Students who decide not to attend classes before the date class work begins must cancel their registration (<http://www.registrar.iastate.edu/students/cancel-withdraw/>) to avoid tuition and fees assessment.

Students who decide not to attend classes beginning the first day of class or later must withdraw from the university (<http://www.registrar.iastate.edu/students/withdrawal/>).

## Course Information

**Prerequisite.** A prerequisite indicates the specific academic background or general academic maturity considered necessary by the faculty for the student to be ready for maximum success in the course. For more information, see Information About Courses (<http://catalog.iastate.edu/informationaboutcourses/>), Course Prerequisite.

**Permission Required courses/sections.** To register for these sections, students must obtain authorization on a Request for Schedule Change or Restriction Waiver form and process the approved form in the Registrar's Student Scheduling Office, 10 Enrollment Services Center.

**Restricted courses/sections.** Some courses or sections are restricted to students who meet specified criteria including curriculum/major, college, and/or year in school. In addition, some sections may be restricted to new students to ensure that sufficient spaces are available when new students register during summer orientation. A department may waive a restriction for a student who has extenuating circumstances. The student must obtain the authorization from the department on a Request for Schedule Change or Restriction Waiver form. The form is processed in the Registrar's Student Scheduling Office, 10 Enrollment Services Center.

Classrooms are listed for each course in the Online Schedule of Classes at <http://classes.iastate.edu/> and on the student's class schedule on AccessPlus, beginning approximately 3 weeks prior to the start of the term.

**Cancelled courses/sections.** In some cases, courses or sections may be cancelled due to low enrollment or departmental staffing considerations. Students who are registered for a cancelled course or section will be notified by the Office of the Registrar, the department, and/or on their AccessPlus schedule.

**Textbook information.** A link to textbook information, including the ISBN and retail price for assigned textbooks, is available from the Schedule of Classes. Textbook information for Iowa State University courses is posted as close to the start of registration as possible. Students may purchase textbooks from any source they choose.

## Credit Limits

For fall and spring semesters, the credit limit is 18 credits for undergraduates and 15 credits for graduate students. For summer session, the limits are 12 credits for undergraduates and 10 credits for graduate students. A student may be required to drop credits before adding another course. In some cases, the college dean may approve a higher or lower credit limit for individual students. Students may request a change in their credit limit by contacting their advisor. Advisors should notify the student's college student services office if the credit limit needs to be changed.

## Registration Holds

Students with holds on their registration will not have access to registration until the initiating offices have released the holds. Those who attempt to register before the holds have been released will receive a message indicating which offices have placed holds on their registration. Prior to their registration, students may check for holds on AccessPlus.

## Drop Limit

Undergraduate students are not limited in the number of courses they may drop during their academic career. Drops processed after the fifth day of classes of each semester will require a schedule change form.

## Auditing

To audit a course means to enroll in the course without receiving credit for the course. The instructor of the course approves the audit request.

Students are assessed tuition and fees as though they are taking the course for credit, but the audited course does not count in determining full-time student status. However, an audited course does count towards the maximum allowable credits per semester. Audited courses do not apply toward V.A. benefits.

Graduate students: See Graduate College, Registration for audit policies.

**Changing status to audit:** Changing a course from credit to audit requires dropping the course for credit and adding it as an audit on a schedule change request form. See Making Schedule Changes. If the change from graded to audit is made during Period 2, the drop appears on the student's permanent record.

**Rights and privileges:** Once enrolled in an audited course, auditors have the same rights and privileges as any student taking the course for credit. Their names appear on the class list with a notation that they are auditing the course. Audited courses do not appear on the student's permanent record except by special request from the student. A request form can be downloaded from the Office of the Registrar website at [www.registrar.iastate.edu/forms](http://www.registrar.iastate.edu/forms) (<http://www.registrar.iastate.edu/forms/>).

## Audit Deadlines and Required Signatures

In addition to the deadlines provided below, note that instructors must approve all audits.

### Full semester courses:

Adding an audit—day 10 deadline:

- Through day 5 of classes: instructor approval required.
- Day 6-10: instructor, advisor approval required.
- After day 10: only with extenuating circumstances, instructor, advisor, college approval required.

Changing status, from credit to audit—day 10 deadline:

- Through day 5 of classes: instructor approval required.
- Day 6-10: instructor, advisor, college approval required.
- After day 10: only with extenuating circumstances, instructor, advisor, college approval required.

Changing status from audit to credit—day 5 deadline:

- Through day 5 of classes: instructor approval required.
- After day 5: instructor, advisor, college approval required.

### Partial semester or summer courses:

Deadlines are determined based on the length of the course. For deadlines concerning partial term or summer courses, contact the Scheduling & Fees Office, 515-294-2331.

## Reinstatement

The procedures delineated in this section apply to students who were dismissed from Iowa State for academic reasons. Students who left Iowa State in good academic standing and who are seeking reentry should see Index, Reentry for more information.

1. Reinstatement is not automatic. Students who have been dismissed for academic reasons should contact the dean's office in the college they wish to enter for instructions specific to that college.  
The college Academic Standards Committee reviews each petition and other relevant information, and reinstatement is based upon that review. As part of the petition process, students must submit a plan for academic success that identifies the causes of their poor academic performance and demonstrates that they have taken actions to avoid or eliminate these causes.
2. Students can only be reinstated after at least one academic semester (fall or spring) has elapsed since they were academically dismissed. Winter session and summer session are not considered semesters.
3. Students who have been dismissed from enrollment two or more times are not eligible for reinstatement until at least two academic semesters (fall and spring) have elapsed since their last academic dismissal. Winter session and summer session are not considered semesters.

4. Students who were dismissed by one college and subsequently reinstated by another college cannot transfer back to the original college unless permission is granted by the Academic Standards Committee of the original college. This procedure applies regardless of the student's academic standing when the transfer is requested.
5. To be considered for reinstatement to the university, students must submit a petition to the Academic Standards Committee of the college in which they desire to enroll at least 45 days before the beginning of the semester. Students who have not been enrolled for a period of 12 or more months or who are international students must also file a reentry form prior to their return. For more information see the Reentry web site at <http://www.registrar.iastate.edu/info/reentry.html> (<http://www.registrar.iastate.edu/students/reentry/>). (Students dismissed for the second time and requesting reinstatement in the College of Liberal Arts and Sciences must submit their petition 70 days before the beginning of the semester.)
6. Juniors and seniors with extenuating circumstances may request a waiver of their required semesters of absence as identified in number 2 and 3 above. The petition requesting early reinstatement must be submitted through procedures specified by their college's Academic Standards Committee.
7. As a condition of reinstatement, students will reenter on academic probation and must accept whatever additional requirements are stipulated by the college Academic Standards Committee. Examples include full- or part-time status, specified credit hours, specific courses, specific GPAs, restriction on choice of major, and required counseling.

## Student Appeal

Students may appeal a decision regarding their academic status if they believe that new information can be provided or extenuating circumstances exist that would alter the application of any rule in this section. The appeal should be made in writing to the Academic Standards Committee of the college in which the student is enrolled. The written appeal must include the reasons for the appeal and the evidence to substantiate these reasons.

The student should initiate the appeal process by contacting the secretary of the college Academic Standards Committee in the administrative office of her or his college immediately upon receipt of notification of the committee's action, and at least ten calendar days before the beginning of the semester. The secretary will then inform the student of the deadline for submission of the written appeal.

If the student is dissatisfied with the committee's action, he or she may submit an appeal in writing to the dean of her or his college within seven calendar days after they are notified of the committee's action. The dean must respond in writing within seven calendar days of receipt of the appeal.

If the issue is not resolved within the college, further appeals may be made in writing to the provost and subsequently to the president of the university. Appeals beyond the college level will, however, be considered only if based on one or both of the following contentions: (a) appropriate procedures were not followed at the college level; (b) academic rules were not applied correctly at the college level.

## Academic Renewal

Students who are returning to Iowa State University to pursue an undergraduate degree after an extended absence may request permission to remove one or more of their complete academic terms from future degree and GPA considerations.

1. Eligibility. To be eligible for academic renewal consideration, students must meet these requirements:
  - a. Students must not have enrolled at Iowa State University for four or more consecutive calendar years.
  - b. Students must not have graduated from Iowa State University.
  - c. Students must have demonstrated satisfactory academic performance as evidenced by earning a GPA of at least 2.00 over a minimum of 12.00 credit hours taken after returning to the university. If more than one semester is taken to reach 12.00 credit hours, the combined GPA of all semesters/terms of enrollment after returning to the university must be 2.00 or greater.
2. Conditions. Academic renewal is based on the following conditions:
  - a. All courses and credits that were taken during the chosen terms will be removed from consideration for GPA and degree requirements. Students may not combine courses from multiple terms to comprise the semester(s) or quarter(s) dropped. Degree requirements met during the dropped terms will ordinarily have to be repeated.
  - b. Renewal may be applied only to academic terms completed prior to the students' extended absence.
  - c. All courses and grades for the chosen terms will remain on the students' academic record.
  - d. Designated repeats, drops and P/NP options will be reinstated for the terms dropped.
  - e. Students who have used all of their drop options will be given one extra drop.
  - f. Students may be granted only one academic renewal.
3. Procedures.
  - a. Students should discuss their desire to pursue academic renewal with an advisor in the college they wish to enter.
  - b. The student must complete the Academic Renewal Petition form available from [www.registrar.iastate.edu/forms](http://www.registrar.iastate.edu/forms) (<http://www.registrar.iastate.edu/forms/>).

- c. After the form is signed by the student and academic advisor, it is submitted to the Records area in the Office of the Registrar, 214 Enrollment Services Center.

## Returning/Reentry to the University

U.S. students who have been absent from Iowa State University less than 12 months may be admitted as a returning student. If more than 12 months have elapsed since last enrolled, a U.S. student must apply for reentry to the university. All international students must apply for reentry regardless of the time away from the university.

### Returning Students

U.S. undergraduate and U.S. non-degree undergraduate students planning to return to Iowa State University after an absence of less than 12 months do not complete a reentry form; however, international undergraduate and international non-degree undergraduate students planning to return to Iowa State University after an absence of less than 12 months must complete a reentry form.

Returning U.S. undergraduate students and graduate students should contact the Office of the Registrar at 515-294-2331 or [reentry@iastate.edu](mailto:reentry@iastate.edu) to have their records updated and registration access created. Students should contact their advisors to select courses and begin the registration process.

International undergraduate students must complete a reentry form regardless of the length of their absence. Forms are available from <http://www.registrar.iastate.edu/forms/>. International Students must also complete the Returning to ISU electronic form for the International Students and Scholars Office in order to receive their new I-20 or DS-2019. The form can be found under the F-1 or J-1 Student Services tab in Cystart at <https://cystart.its.iastate.edu>. If you have questions or concerns in regards to your documents, please contact the International Students and Scholars Office at 515-294-1120 or [isso@iastate.edu](mailto:isso@iastate.edu).

Returning students who want to change their curricula should follow the same procedure as in-school students. Students who were dropped from enrollment at Iowa State University must obtain reinstatement by the Academic Standards Committee of the college that they wish to reenter. (See Reinstatement/Renewal for policies that apply to requests for reinstatement).

### Reentry Students

Undergraduate and nondegree undergraduate (special) students who plan to attend Iowa State University after an absence of twelve months or more must complete a reentry form. Forms are available from <http://www.registrar.iastate.edu/forms/>.



Students with a bachelor's degree who plan to take supporting graduate level coursework prior to applying for graduate degree admission should request a nondegree graduate admission application.

Students who have previously attended Iowa State University only as nondegree (special) students and who now seek to earn an undergraduate degree should request an undergraduate application.

International Students must also complete the Returning to ISU electronic form for the International Students and Scholars Office in order to receive their new I-20 or DS-2019. The form can be found under the F-1 or J-1 Student Services tab in Cystart at <https://cystart.its.iastate.edu>. If you have questions or concerns in regards to your documents, please contact the International Students and Scholars Office at 515-294-1120 or [isso@iastate.edu](mailto:isso@iastate.edu).

The reentry form should be completed and returned to the Office of the Registrar, 10 Enrollment Services Center, well in advance of the term of reentry. Students who have attended another college or university since enrollment at Iowa State University must have an official transcript(s) of all course work attempted sent to the Office of Admissions, 100 Enrollment Services Center.

Reentering students must also contact their departmental office/advisor to prepare a class schedule. Reentry must be approved prior to registration.

Iowa State University requests the information on the reentry form for the purpose of making a reentry decision. The university reserves the right not to approve reentry if the student fails to provide the required information.

## Graduate Students

Returning graduate students that have been enrolled in the last 24 months and are looking to continue in the same program, should contact the Office of the Registrar at 515-294-2331 or [reentry@iastate.edu](mailto:reentry@iastate.edu) to have their records updated and have registration access created. Students should contact their major professor to select courses and begin the registration process.

Reentering graduate students that have not been enrolled in the last 24 months, or are looking to come back in a different program than previously enrolled, please go to the Returning Graduate Students (<https://www.grad-college.iastate.edu/common/forms/inactive-to-active/>) website and follow the instructions for your specific situation.

Please contact the Graduate College at 515-294-4531 if you have question on returning to the Graduate College.

International students also need to contact International Students and Scholars Office, 3248 Memorial Union, Ames, IA 50011-1130, phone:

515-294-1120, fax: 515-294-8263, or email: [intlserv@iastate.edu](mailto:intlserv@iastate.edu) to find out any steps that need to be taken prior returning.

## Reentry Approval Process

Generally, a request to reenter Iowa State University will be approved within the Office of the Registrar. However, the Office of the Registrar will refer the reentry form to the college to which a student plans to return if the student: (a) desires to change curriculum; (b) has a previous Iowa State University cumulative grade point average below 2.00; (c) was dropped from the university for unsatisfactory academic progress or was not otherwise in good standing; or (d) since leaving Iowa State University, has completed additional college study with less than a 2.00 grade point average.

## Information About Courses

Find the full listing of courses at A-Z Courses

### Course Numbers

The courses in each department are numbered from 1 to 699 (Future State: 0001-7999), according to the following groups:

- 1-99 (Future State: 0001-0999) Courses not carrying credit toward a degree (zero credit).
- 100-299 (Future State: 1000-2999) Courses primarily for freshman and sophomore students.
- 300-499 (Future State: 3000-4999) Courses primarily for junior and senior students.
- 500-599 (Future State: 5000-5999) Courses primarily for graduate students, but open to qualified undergraduates.
- 600-699 (Future State: 6000-6999) Courses for graduate students.
- Future State: 7000-7999 Professional courses

### Off-campus courses-Residential Credit

Iowa State University faculty teach distance learning courses online by video conferencing and streaming media. Courses are the same as those offered on campus, carry residential credit, and are taught by Iowa State faculty. Credit earned becomes a part of the academic record at Iowa State University and may be used to meet degree requirements the same as credit earned on campus.

### Priority Enrollment

High demand for courses in certain areas has necessitated enrollment management for some courses. When enrollment priority is established for a course, first consideration is given to students whose curriculum/major explicitly requires the course.

### Course Fees

Courses for which course fees are assessed are designated in the Schedule of Classes. Course fees may be assessed for such extraordinary costs as materials fees (which may include consumable



materials or equipment replacement), field trip expenses, developmental course fees, and camp fees. In some cases, course fee amounts vary from term to term. Additional information on camp fees and developmental course fees may be found in the fees webpage at <https://www.registrar.iastate.edu/fees/othfee> (<https://www.registrar.iastate.edu/fees/othfee/>).

## Independent Study

Most departments offer opportunities for independent study through a 490 (Future State: 4900) course listing. Usually a minimum of 6 to 10 credits of coursework in the department is required before independent study is permitted. Students who are interested in this kind of experience in a particular department should check the catalog to determine the department's prerequisites to register for 490 (Future State: 4900). 490H (Future State: 4900H) sections are reserved for students in the University Honors Program.

Students should check with the department about procedures, in addition to meeting the prerequisites, for registering for 490 (Future State: 4900). A written plan of study is prepared in advance with a faculty member who has agreed to supervise the student's work, to evaluate progress and the final product, and to assign a grade. Initiation of the plan of study should occur prior to the semester in which enrollment is desired. Both the student and the instructor should agree on the number of credits for which the student will enroll, the amount and kind of work the student do for that credit, and the system by which the student will be graded (A-F or S/F). Students should not expect to register for or add 490 (Future State: 4900) credit without an instructor's permission. Some colleges and/or departments have limits on the number of credits of 490 (Future State: 4900) that may be applied toward graduation.

## Credits and Contact Hours

The academic value of each course is stated in semester credits. Each credit is normally earned by attending one (50-minute) hour of lecture per week for the entire 16-week semester, or by attending a laboratory or studio period of two or three hours per week. As a guideline, undergraduate students typically will be expected to spend two hours in preparation outside of class for each lecture hour; additional outside work may be required for laboratory or studio classes. The Office of the Registrar will maintain a table of faculty-approved credit-contact hour equivalencies for the types of instruction (e.g. lecture, studio, internships, research courses) offered by the institution: <https://www.registrar.iastate.edu/faculty-staff/offeringinfo/define> (<https://www.registrar.iastate.edu/faculty-staff/offeringinfo/define/>).

Courses offered for less than a full semester (e.g. summer terms or compressed formats) will fulfill the same contact hour requirements as full-semester courses having the same credit hours. For example, a student enrolled in a one-credit course offered in an 8-week (half-semester) format should expect two hours of lecture and four hours of

out of class preparation per week. Similarly, a course offered in hybrid or online format is expected to meet the same contact hour requirement, and offer equivalent student-faculty/student-student interaction and class preparation time, as the same course taught in a traditional format.

Each course states the number of semester credits assigned to the course, preceded in parentheses by the number of hours in class (contact hours) expected of the student. The first of the two contact-hour numbers indicates the number of lecture class hours per week for the semester. The second is the number of laboratory or studio hours required per week. Laboratory and studio hours may include some time devoted to lectures. For example, COM S 227 Object-oriented Programming is listed as (3-2) Cr. 4. In that case, the course is 4 semester credits, 3 hours of lecture and two hours of laboratory each week.

The term "Cr. arr." means that the amount of credit is arranged in advance between the student and the instructor. The credit to be earned depends on the amount of work expected of the student, in accordance with the policy that some combination of teacher-student contact and outside work by the student involving at least three hours per week for the semester is required for each credit.

The term "Cr. R." means that the course is required in a certain curriculum or as cognate to one or more other courses. It is also used for cooperative education courses and for some optional inspection trips, study tours, and professional development courses for which numerical credit is not granted. An R credit course does not carry numerical credit toward a student's degree, but it does apply toward the degree. The R credit course is generally listed on the degree program as a requirement for a specific curriculum/major that must be completed prior to graduation. R credit courses may be graded using the A-F grading scale or the satisfactory/fail grading scale. All R credit courses are assigned a numerical value for purposes of enrollment certification. Requests by students to drop an R credit course will be processed as an administrative drop during period 2 and will not appear on the student's transcript. (See Schedule Changes.)

## Credit Involving a Paid Activity

Students may obtain credit for an activity, either on- or off-campus, for which they are also paid, provided the activity is academically relevant. This policy does not apply to registrations for R credit.

In order for an activity to be defined as academically relevant, prior arrangements for receiving credit must be made with a faculty member in an appropriate department.

The arrangements must include agreement on (1) the academic objectives which the activity is expected to achieve, and (2) the procedure by which the student's learning will be assessed.

## Semester of Offering

Within each course description may be found one or more of the following letters: F, S, SS., indicating which term—fall, spring, summer session—of the academic year the course is offered. “Alt.” is the abbreviation for alternate. If there is sufficient demand, courses may be offered more frequently than announced. Insufficient demand or unforeseen staffing problems may result in the cancellation of announced offerings. Students are advised to refer to the Schedule of Classes or consult with departments for up-to-date course schedule information.

## Course Prerequisite

A prerequisite indicates the specific academic background or general academic preparedness considered necessary for the student to be ready to undertake the course. Prerequisites are usually stated in terms of specific courses, but equivalent preparation is usually acceptable. An instructor may, however, direct a student whose background does not meet the stated prerequisite, or its equivalent, to drop the course. Conversely, an instructor may waive the prerequisite (or approval may be given following the appropriate departmental process) for a course for which they are responsible. Thus, permission of the instructor (or departmental process) is understood to be an alternate to the stated prerequisites.

It is university policy that the department or instructor informs enrolled students who have not met the prerequisite requirements that they must drop the course. Instructors have the right to neither accept, nor grade the work of a student who does not meet the stated prerequisite, or its equivalent (as determined by the process established in the department offering the course). Notification should be done as soon as possible and prior to the first day of class whenever possible. For students enrolled after the first day of class, notification must be given as soon as possible.

Some courses have been approved by their colleges to use administrative drops to enforce prerequisites. In such cases, the department shall inform the enrolled students who have not met the prerequisite requirements that they must drop the course or provide evidence of equivalent preparation to be reviewed by the department. Notification should be done prior to the first day of class for students enrolled prior to the first day of class. For students enrolled after the first day of class, notification must be given as soon as possible. After such notification (via email or Canvas announcement), the student must drop the course within 3 business days, or initiate a review of their equivalent preparation. This timeframe should be indicated to the student during the notification process. If a student does not drop the course or have a successful review of an equivalent, the department or instructor may contact their college student services office to initiate an administrative drop to remove the student from the course. Additionally, students whose request to waive the prerequisite is denied, will be administratively dropped from the course. Administrative drops will be completed by the

10th day of the semester in most cases. Course prerequisites are listed in the Schedule of Classes as well as in the Courses and Programs section of this publication.

## Cross-listed Courses

A course, including its complete description, may be listed in two or more departments. The participating department or departments are noted in parentheses. Credit for the course may be obtained through any of the cross-listed departments.

## Dual-listed Courses

Dual-listed courses permit undergraduate and graduate students to be in the same class while receiving credit for either undergraduate or graduate level work.

Credit in the graduate course is not available to students who have received credit in the corresponding undergraduate course. Both graduates and undergraduates receive the same amount of credit for the course, but additional work is required of all graduate students taking the course under the graduate-level course number. This extra work may take the form of additional reading, projects, examinations, or other assignments as determined by the instructor. The instructor must be a member of the Graduate Faculty or a Graduate Lecturer. Each dual-listed course is designated in the catalog with the phrase “Dual-listed with,” although the student’s official transcript of credits, both graduate and undergraduate, does not identify dual-listed courses as such. There is a limit to the number of dual-listed course credits that may be used to meet the requirement for an advanced degree. (For information about procedures for requesting permission to offer dual-listed courses, faculty should consult the Graduate Faculty Handbook.)

## Entry Level Courses

### Resources for Course Information

<http://catalog.iastate.edu/azcourses/>

<http://classes.iastate.edu>

Experimental course listings: courses not published in the catalog. (<https://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

The following courses are suitable for first year students. Course numbers that begin with 0 (e.g., CHEM 050) may incur an additional “developmental course” fee. See the Tuition and Fees web site for more information about other fees (<http://www.registrar.iastate.edu/fees/othfee/>).

**A B E 160: Systematic Problem Solving and Computer Programming**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in (MATH 143 or MATH 165)*

Systematic problem-solving using principles of dynamics, statics, mass/energy conservation, and algorithmic thinking. Use of spreadsheet programs and computer programming language(s) to solve engineering problems. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**A B E 170: Engineering Graphics and Introductory Design**

(2-2) Cr. 3.

Applications of multi-view drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process including written and oral reports.

**A M D 131: Fashion Products and Markets**

(3-0) Cr. 3. F.

Fashion industry from concept to consumer. Focus on fashion-driven consumer goods. Development and prototyping of fashion products for a target market.

**A M D 165: Dress, Appearance, and Diversity in U.S. Society**

(3-0) Cr. 3. F.S.

Analyze foundational concepts and theories related to dress, identity, fashion, and culture and how they intersect with sex, gender, sexuality, beauty, attractiveness, disability, religion, race, and ethnicity with heightened attention to marginalized communities in the United States. Analyze the experiences and the role of fashion, clothing, dress, and/or accessories for identity development. Critique the social justice issues within the fashion system and identify the driving forces of transformative social justice change in the fashion system. Deconstruct one's personal values and positionalities in relation to fashion, clothing, dress, and/or accessories.

Meets U.S. Diversity Requirement

**ADVRT 230: Advertising Principles**

(3-0) Cr. 3.

Historical, social, economic and legal aspects of advertising. Evaluations of advertising research, media, strategy and appeals. Study of the creation of advertising.

**AER E 160: Aerospace Engineering Problems With Computer Applications Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Solving aerospace engineering problems and presenting solutions through technical reports. Significant figures and estimation. SI units. Graphing and curve fitting. Introduction to aerospace engineering and engineering design. Spreadsheet programs. History of aerospace. Systems thinking. Team projects. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**AF AM 201: Introduction to African American Studies**

(3-0) Cr. 3. F.S.

An interdisciplinary introduction to the study of African American culture. Includes history, the social sciences, literature, religion, and the arts, as well as conceptual frameworks for investigation and analysis of the African American experience.

Meets U.S. Diversity Requirement

**AFAS 141: Foundations of the United States Air Force**

(1-0) Cr. 1. F.

No-commitment exploratory course introducing the United States Air Force and the Air Force Reserve Officer Training Corps program. Topics include Air Force heritage and culture, professional military officership values and expectations, and future career opportunities with an emphasis on cultivating leadership and communication skills.

**AGRON 120: Introduction to Renewable Resources**

(Cross-listed with ENV S, NREM). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**AGRON 180: Global Agriculture in a Changing World**

(3-0) Cr. 3. F.

A scientific investigation of the global distribution of climate, soils and agricultural production and consumption. Physical processes that connect natural resources to agriculture and the environment. How global change drives increasing demand for agricultural production.

Meets International Perspectives Requirement.

**AGRON 206: Introduction to Weather and Climate**

(Cross-listed with MTEOR). (3-0) Cr. 3. F.S.

Basic concepts in weather and climate, including atmospheric measurements, radiation, stability, precipitation, winds, fronts, forecasting, and severe weather. Applied topics include global warming, ozone depletion, world climates and weather safety.

**AM IN 201: Native People in American Culture**

(3-0) Cr. 3. F.S.SS.

Perceptions and realities of Native people living in and responding to American society and culture. Topics include representations, contemporary Native identity, literature, the arts, history, film, and issues of diversity.

**AM IN 210: Introduction to American Indian Studies**

(3-0) Cr. 3. F.S.SS.

Introduction to the multidisciplinary aspects of American Indian Studies. Topics include the relevant events and ideas defining the contemporary American Indian experience, on and off reservation, in the United States. Sovereignty, identity, jurisdiction, taxes, economic development, education, and other issues are addressed.

Meets U.S. Diversity Requirement

**AN S 101: Working with Animals**

(1-2) Cr. 2. F.S.SS.

An introductory course in skills for proper care, handling, and management of domestic animals. Terminology and skills in working with animals, identification, life-cycle management practices, and animal health management are introduced and examined.

**AN S 114: Survey of the Animal Industry**

(2-0) Cr. 2. F.S.

Principles of management and care of domestic animals, including genetics, nutrition, and reproduction. Service of domestic animals to society in terms of food, shelter, protection, fuel and emotional well-being. Basic biology, industry structure, management practices and production systems.

**ANTHR 201: Introduction to Cultural Anthropology**

(3-0) Cr. 3. F.S.SS.

Introduction to the core concepts, theories, and methods of cultural anthropology with an emphasis on understanding human cultural diversity in global society from an anthropological perspective.

Meets International Perspectives Requirement.

**ANTHR 202: Human Origins**

(3-0) Cr. 3. F.S.

Human biological and cultural evolution; survey of the evidence from fossil primates, the human fossil record and the archaeological record, as well as living primates; introduction to research methods in archaeology and biological anthropology.

**ANTHR 230: Globalization and the Human Condition**

(3-0) Cr. 3. F.S.

An introduction to understanding key global issues in the contemporary world. Focuses on social relations, cultural practices and political-economic linkages among Africa, the Americas, Asia, Europe and the Pacific.

Meets International Perspectives Requirement.

**ARCH 221: Histories and Theories of Architecture to 1750**

(3-0) Cr. 3. F.

Survey of architectural ideas, theories, and practices before 1750.

Emphasis on the mutually formative relationship between architecture and the social, cultural, economic, and political forces, nationally and globally, in which it is produced.

Meets International Perspectives Requirement.

**ART H 280: History of Art I**

(3-0) Cr. 3. F.

Development of the visual arts including painting, sculpture, architecture, and crafts, from the prehistoric through Gothic periods.

Meets International Perspectives Requirement.

**ART H 292: Introduction to Visual Culture Studies**

(3-0) Cr. 3.

An introduction to various topics in visual culture studies, including significant trends in the visual arts, mass media, scientific imagery, visual communications, and other areas related to visual literacy and visual representation in local and global contexts. Cross cultural viewpoints and issues of diversity will be presented in relation to visual culture.

**ASTRO 103: Evening Star**

Cr. 1. F.S.SS.

An entirely web-based course covering topics in celestial mechanics ("Rocket science!") for students with little or no previous experience.

It combines the geography of the solar system with discussion of methods of traveling to the other planets. The course "lectures" are on-line, interactive units with built-in exercises, hands-on (offline) activities, and layers of help. Graded homework and quizzes are administered via Canvas. Students who take Astro 120 may count credit in only one of Astro 102 or 103 toward graduation.

**ASTRO 120: The Sky and the Solar System**

(3-0) Cr. 3. F.S.SS.

For the nonscientist. A survey of our view of the universe, and the exploration of the solar system and beyond. The sky: constellations; motions of the Sun, Moon, and planets; seasons and the calendar; eclipses. The solar system: origin and evolution; characteristics of the Sun, planets, satellites, comets, meteorites, and asteroids. The detection and characterization of other solar systems, and the search for life in the universe. Extensive use of the planetarium is included. Students who take Astro 120 may count credit in only one of Astro 102 or 103 toward graduation.

**ASTRO 150: Stars, Galaxies, and Cosmology**

(3-0) Cr. 3. F.S.

For the nonscientist. A survey of astronomy with a focus on the universe beyond our solar system. Basic observational astronomy and the history of astronomy. Stellar astronomy: motions, distances, sizes, spectra; types of stars; variability; binary systems. Stellar evolution: the birth, life, and death of stars, including supernovae, neutron stars, and black holes. The structure and evolution of the Milky Way Galaxy. Other galaxies, clusters of galaxies, quasars. Theories of the origin of the universe.

**BBMB 101: Introduction to Biochemistry**

(1-0) Cr. 1. F.

Foundational principles of the molecules and chemistry of life, including structure and function of biological molecules: protein, lipids, nucleic acids, and carbohydrates. Survey of modern biotechnology frontiers. For students majoring in Biochemistry or Biophysics or considering one of these majors.

**BIOL 101: Introductory Biology**

(3-0) Cr. 3. F.S.SS.

Life considered at cellular, organism, and population levels. Function and diversity of the living world. Presentation of basic biological principles as well as topics and issues of current human interest. Does not satisfy biology major requirements.

**BIOL 155: Human Biology**

(3-0) Cr. 3. F.S.

A survey course of human biology, including principal structures and functions of the body systems and the diseases and disorders associated with them. Designed to meet general education requirements in natural science. Not recommended for those seeking a career in the allied health professions or for students majoring in life science. Does not satisfy biology major requirements.

**BIOL 173: Environmental Biology**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment. Discussions of human population growth, biodiversity, sustainability, resource use, and pollution. Does not satisfy biology major requirements.

**BIOL 211: Principles of Biology I**

(3-0) Cr. 3. F.S.

*Prereq: High school biology*

Introduction to the nature of life, including the diversity of microbial, plant, and animal life; the nature of heredity; evolution; and principles of ecology. Intended for life science majors.

**BIOL 211L: Principles of Biology Laboratory I**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 211*

Laboratory to accompany 211.

**BIOL 212: Principles of Biology II**

(3-0) Cr. 3. F.S.

*Prereq: High School Biology; High School Chemistry or credit or enrollment in CHEM 163 or CHEM 177*

Introduction to the chemical, molecular, and cellular basis of life; form and function of microbial, plant, and animal life. Intended for life science majors. HS courses in biology and chemistry necessary. Credit or enrollment in CHEM 163 or CHEM 177 recommended.

**BIOL 212L: Principles of Biology Laboratory II**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 212*

Laboratory to accompany 212.

**BIOL 255: Fundamentals of Human Anatomy**

(3-0) Cr. 3. F.

*Prereq: High School Biology and Chemistry or BIOL 101*

An introduction to human anatomy, beginning with cells and tissues, surveying all body systems, relating form to function. Systems covered include: integumentary, bones and joints, muscles, nervous, sensory, endocrine, circulatory, lymphatic, respiratory, digestive, urinary, and reproductive. Pre-Medical students should consider BIOL 351 for their anatomy background. Does not satisfy biology major requirements. HS courses in biology and chemistry necessary. Credit or enrollment in BIOL 101 recommended.

**BIOL 255L: Fundamentals of Human Anatomy Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in BIOL 255*

Investigation of human anatomy using models and dissections of preserved organs and model mammals. Pre-Medical students should consider 351 for their anatomy background. Does not satisfy biology major requirements.

**BUSAD 102: Business Learning Team Orientation**

(1-0) Cr. 1. F.S.

A required orientation for all College of Business Students involved with a Business Learning Team. Review of college and university requirements, transfer credits, academic planning, university policies and deadlines and registration procedures. Includes a consideration of various business majors and careers, tools for success in college including writing skills and presentations from employers, alumni and current students. Only one of BusAd 102 or BusAd 103 may be counted towards graduation.

**BUSAD 103: Orientation**

(1-0) Cr. 1. F.S.

A required orientation for all College of Business students. Review of college and university requirements, transfer credits, academic planning, university policies and deadlines, and registration procedures. Includes group advising for course selection and registration. Only one of BUSAD 102 or BUSAD 103 may be counted toward graduation.

**C E 160: Engineering Problems with Computational Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 165*

Engineering approach to solving problems and presenting results with applications to examples in civil, construction, and environmental engineering, such as problems in statics. Dimensions and units. Data processing, graphing, and curve fitting. Formulating and solving fundamental and practical engineering problems with spreadsheets and a structured programming language. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**C E 170: Graphics for Civil Engineering**

(0-4) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143 or MATH 145 (or satisfactory scores on mathematics placement assessments)*

Integration of fundamental graphics, computer modeling, and engineering design. Applications of multiview drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process. Freehand and computer methods. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**C R P 201: The North American Metropolis**

(3-0) Cr. 3. F.S.

Examination of the evolution of American urban centers from the colonial era to the present. Considers the demographic changes and social movements underway in urban America and explores how an understanding of the history of cities provides us with knowledge that we can use to improve our cities today.

**C R P 251: Fundamentals of Geographic Information Systems**

Cr. 3. F.

Fundamentals of the concepts, models, functions and operations of Geographic Information Systems (GIS). Principles of spatial problems, spatial questions and hypotheses and their solutions based on spatial data, GIS tools and techniques. Integration of concepts and applications through lectures and facilitated labs. Applications from a variety of areas including design; physical, social, and human science; engineering; agriculture; business and medicine, landscape architecture, architecture, urban planning, geology, forestry, biology, and ecology.

**CH E 160: Chemical Engineering Problems with Computer Applications Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Formulation and solution of engineering problems. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to material balances, engineering economics, and design. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. Chemical Engineering examples. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, CH E 160, C E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**CHEM 050: Preparation for College Chemistry**

(3-0) Cr. 0. F.S.

An in-depth active learning experience designed to impart the fundamental concepts and principles of chemistry, with an emphasis on mathematics skills and logical thinking. For students intending to enroll in general chemistry and who have not taken high school chemistry or who have not had a high school college preparatory chemistry course who need a review of chemical problem solving and chemical concepts. 1 year high school algebra recommended. Credit for Chem 50 does not count toward graduation.



**CHEM 160: Chemistry in Modern Society**

(3-0) Cr. 3. F.S.

Aspects of chemistry visible to a non-scientist in our society. A survey of selected areas of chemistry with emphasis on the interface between chemistry and other fields of human activity.

**CHEM 163: College Chemistry**

(4-0) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 163L*

A general survey of chemistry with an emphasis on conceptual problems for those who are not physical and biological science or engineering majors. Nomenclature, chemical reactions, stoichiometry, atomic structure, periodic properties, chemical bonding, states of matter, solutions, thermochemistry, acid-base theory, oxidation-reduction reactions, basic chemical kinetics, and chemical equilibrium. 1 year of high school algebra and geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 163L: Laboratory in College Chemistry**

(0-3) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 163*

Laboratory to accompany CHEM 163. Must be taken with CHEM 163.

Only one of Chem 163L, CHEM 167L, and CHEM 177L may count toward graduation.

**CHEM 167: General Chemistry for Engineering Students**

(4-0) Cr. 4. F.S.

Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer. MATH 140 or 2 years of high school algebra and 1 year of high school geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 177: General Chemistry I**

(4-0) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 177L*

The first semester of a two semester sequence which explores chemistry at a greater depth and with more emphasis on concepts, problems, and calculations than 163. Recommended for physical and biological science majors, chemical engineering majors, and all others intending to take 300-level chemistry courses. Principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermochemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding. Chemistry and Biochemistry majors may consider taking CHEM 201. MATH 140 or 2 years of high school algebra and 1 year of high school geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 177L: Laboratory in General Chemistry I**

(0-3) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 177*

Laboratory to accompany 177. 177L must be taken with 177. Only one of Chem 163L, 167L, and 177L may count toward graduation.

**CHEM 177N: Laboratory in General Chemistry I**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in CHEM 177*

Laboratory to accompany CHEM 177. CHEM 177N must be taken with CHEM 177. For Chemistry and Biochemistry majors. Laboratory to accompany CHEM 177. CHEM 177N must be taken with CHEM 177. Only one of CHEM 163L, CHEM 167L, and CHEM 177N may count toward graduation.

**CHEM 178: General Chemistry II**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 163 or CHEM 167 or (CHEM 177; CHEM 177L)*

Continuation of 177. Recommended for physical or biological science majors, chemical engineering majors, and all others intending to take 300-level chemistry courses.

**CHEM 178L: Laboratory in College Chemistry II**

(0-3) Cr. 1. F.S.SS.

*Prereq: CHEM 177L; credit or concurrent enrollment in CHEM 178*

Laboratory to accompany 178. 178L is not a necessary co-requisite with 178.

**CHEM 201: Advanced General Chemistry**

(5-0) Cr. 5. F.

*Prereq: Credit or concurrent enrollment in MATH 165 or MATH 166 or MATH 265; concurrent enrollment in CHEM 201L*

A one-semester course in general chemistry designed to give students an in-depth, broad-based view of modern chemistry, and, in part, to facilitate participation in independent undergraduate research. Topics include stoichiometry, atomic and molecular structure, chemical bonding, kinetics, chemical equilibria, and thermodynamics. Discussion of current trends in various chemical disciplines, which may be given by guest experts in chemistry, biochemistry, and chemical engineering, will help the student appreciate the scope of the chemical sciences and how research is carried out. One year HS chemistry and one year HS physics, or advanced chemistry necessary. Only one of CHEM 163, 167, 177, or 201 may count toward graduation.

**CHIN 101: Elementary Mandarin Chinese I**

(4-0) Cr. 4. F.

Introduction to spoken and written colloquial Mandarin through pinyin and simplified characters. For students whose native language is not Chinese.

**CHIN 201: Intermediate Mandarin Chinese I**

(4-0) Cr. 4. F.

*Prereq: CHIN 102*

Development of speaking, writing, reading, and listening skills. Review and expansion of grammar skills, intensification of character acquisition. For students whose native language is not Chinese. Meets International Perspectives Requirement.

**C J 240: Introduction to the U.S. Criminal Justice System**

(3-0) Cr. 3. F.

Provides systematic overview of law, police organization and behavior, prosecution and defense, sentencing, the judiciary, community corrections, penology, and capital punishment. The course demonstrates the role of discretion in all of these agencies as well as the sociological influences of age, race, gender, and social class on criminal justice system processes.

**CL ST 273: Greek and Roman Mythology**

(3-0) Cr. 3.

Survey of the legends, myths of the classical world with emphasis on the principal gods, and heroes, and their relation to ancient social, psychological, and religious practices; some attention may be given to important modern theories.

Meets International Perspectives Requirement.

**COM S 101: Orientation**

Cr. R. F.S.

Required orientation class for all incoming students in the Computer Science major. Topics include academic planning and policies, campus resources, and supports. Opportunity to connect with other computer science peers, faculty, alumni, and employers. Offered on a satisfactory-fail basis only.

**COM S 103: Computer Literacy and Applications**

Cr. 4. F.S.SS.

Introduction to computer literacy and applications. Literacy: Impact of computer technology in today's societies, hardware, software, software programming, database and information systems, communication and networks, digital media technology, computer security and safety, ethics and privacy. Applications: In-depth hands-on experience with the operating systems, Microsoft word processing, spreadsheets, database management and presentation software. No prior computer experience necessary. Offered online only.

**COM S 104: Brief Introduction to Computer Programming for Non-Majors**

(1.5-1) Cr. 2. F.S.

Offered first 8 weeks and last 8 weeks. Use of personal computer and workstation and beginning programming. Project-oriented approach to computer operation and programming, including use of tools to aid in programming. Topics from computer history, using basic Windows and MacOS tools, program structure, expression, variables, decision and logic, and iteration. No prior computer experience necessary.

**COM S 107: Windows Application Programming**

(3-0) Cr. 3. F.S.

Introduction to computer programming for non-majors using a language such as the Visual Basic language. Basics of good programming and algorithm development. Graphical user interfaces.

**COM S 113: Introduction to Spreadsheets and Databases**

(2-2) Cr. 3. F.S.SS.

Using Microsoft Excel spreadsheets and Microsoft Access databases to input, store, process, manipulate, query, and analyze data for business and industrial applications. Credit in Com S 113 may not be applied toward graduation in the S E and CPR E majors.

**COM S 207: Fundamentals of Computer Programming**

(3-1) Cr. 3. F.S.SS.

*Prereq: MATH 150 or placement into MATH 140 or higher*

An introduction to computer programming using an object-oriented programming language. Emphasis on the basics of good programming techniques and style. Extensive practice in designing, implementing, and debugging small programs. Use of variable, if-statement, looping, method, and class. Interactive and file I/O. This course is not designed for computer science, software engineering, and computer engineering majors. Credit may not be applied toward graduation for both COM S 207 and COM S 227.

**COM S 227: Object-oriented Programming**

(3-2) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in MATH 143 or higher; (COM S 127 or CPR E 185 or S E 185 or E E 285)*

Computer programming using objects as the mechanism for modularity, abstraction, and code reuse. Instance variables, methods, and encapsulation. Review of control structures for conditionals and iteration. Developing algorithms on strings, arrays, and lists. Recursion, searching, and sorting. Text parsing and file I/O. Interfaces, inheritance, polymorphism, and abstract classes. Exception handling. Tools for unit testing and debugging. Emphasis on a disciplined approach to specification, code development, and testing. Course intended for majors in computer science and related fields. Credit may not be applied toward graduation for both Com S 207 and 227.

**COM S 228: Introduction to Data Structures**

(3-1) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in COM S 227; credit or concurrent enrollment in MATH 165*

An object-oriented approach to data structures and algorithms. Object-oriented analysis, design, and programming, with emphasis on data abstraction, inheritance and subtype polymorphism, and generics. Abstract data type specification and correctness. Collections including lists, stacks, queues, trees, heaps, maps, hash tables, and graphs. Big-O notation and algorithm analysis. Searching and sorting. Graph search and shortest path algorithms. Emphasis on object-oriented design, writing and documenting medium-sized programs. This course is designed for majors.

**COMST 101: Introduction to Communication Studies**

(3-0) Cr. 3.

An introduction to communication theory, the development and functions of communication, and a survey of verbal, nonverbal, interpersonal, small group, organizational, and intercultural communication.

**COMST 211: Interpersonal Communication**

(3-0) Cr. 3.

Application of major principles related to interpersonal communication theories, concepts, and research. Emphasis on using interpersonal communication skills effectively.

**CPR E 131: Introduction to Computer Security Literacy**

(Cross-listed with CYBSC). (1-0) Cr. 1.

Basic concepts of practical computer and Internet security: passwords, firewalls, antivirus software, malware, social networking, surfing the Internet, phishing, and wireless networks. This class is intended for students with little or no background in information technology or security. Basic knowledge of word processing required. Offered on a satisfactory-fail basis only.

**CPR E 185: Introduction to Computer Engineering and Problem Solving I**

(2-2) Cr. 3.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Introduction to Computer Engineering. Project based examples from computer engineering. Individual interactive skills for small and large groups. Computer-based projects. Solving engineering problems and presenting solutions through technical reports. Solution of engineering problems using a programming language. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**DANCE 270: Dance Appreciation**

(3-0) Cr. 3. F.S.

Introduction to the many forms and functions of dance in world cultures. Develop abilities to distinguish and analyze various dance styles. No dance experience required. Meets International Perspectives Requirement.

**DES 230: Design Thinking**

(3-0) Cr. 3.

Introduction to design thinking processes, toolkits, and mindsets, and its interaction with art, design, and technology. Emphasis on interdisciplinary practices.

**DS 201: Introduction to Data Science**

Cr. 3. F.S.Alt. SS., offered irregularly.

*Prereq:* Placement into MATH 143

Data Science concepts and their applications; domain case studies with applications in various fields; overview of data analysis; major components of data analysis pipelines; computing concepts for data science; descriptive data analysis; hands-on data analysis experience; communicating findings to stakeholders, and ethical issues in data science. Placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**DSN S 102: Design Studio I**

(1-6) Cr. 4.

A foundation design studio exploring two and three-dimensional design. Emphasis on fundamental skills and ideas shared across design disciplines. Creative processes, visual order, materials, and critical thinking are investigated through studio projects. Lectures and discussions cover the topics introduced in studios.

**DSN S 115: Design Collaborative Seminar**

(1-0) Cr. 1.

*Prereq:* Member of Design Collaborative Learning Community

Orientation to the College of Design. Introduction to the design disciplines and studio pedagogy.

**DSN S 131: Drawing I**

(1-6) Cr. 4.

An introduction to methods of visual thinking and drawing through studio experiences and lectures. All design fields utilize visual communication and drawing. Focus on the use of drawing as a method for creative problem solving, design development and visual communication. Explore, from observation and imagination, the use of fast sketching and in-depth drawing, using various scales, mediums and processes.

**DSN S 183: Design in Context**

(3-0) Cr. 3.

Explores designed media, objects, places, spaces, structures, and systems as products of varied and often intersecting contexts. Using historical and contemporary case studies, investigates how cultural, economic, environmental, spatial, social, and temporal contexts, among others, affect design. Explores in particular how design addresses complex and multifaceted problems.

**DSN S 232: Digital Design Communications**

(3-0) Cr. 3.

Introductory investigations of various digital design media to develop multi-dimensional problem solving, digital communication skills and perceptual sensitivity. Open to all university majors.

**E E 185: Introduction to Electrical Engineering and Problem-Solving I**

(2-2) Cr. 3. F.S.

*Prereq:* (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165

Project based examples from electrical engineering. Systematic thinking process for engineering problem solving. Group problem solving. Mathematical, conceptual and computer based projects. Solving engineering problems and presenting solutions through technical reports and oral presentations. Solutions of engineering problems using computation tools and basic programming. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**ECON 101: Principles of Microeconomics**

(3-0) Cr. 3. F.S.SS.

Resource allocation, opportunity cost, comparative and absolute advantage. Supply and demand. Marginal analysis. Theories of production and consumption, pricing, and the market system. Perfect and imperfect competition and strategic behavior. Factor markets. Present discounted value.

**ECON 101L: Laboratory in Principles of Microeconomics**

(0-2) Cr. 1. F.

*Prereq:* Concurrent enrollment in the appropriate section of ECON 101

Discussion of material typically covered in Econ 101. Application of economic principles to real world problems. Economic principles and basic business management concepts applied to decision-making in agribusiness operations.

**ECON 102: Principles of Macroeconomics**

(3-0) Cr. 3. F.S.SS.

Measurement of macro variables and general macro identities. Classical models of full employment. Production and growth. Savings and investment. Employment and unemployment. Money, inflation, and price levels. Operation of the U.S. banking system. Fiscal and monetary policy. Elements of international finance. ECON 101 recommended.

**ECON 235: Introduction to Agricultural Markets**

(3-0) Cr. 3. F.S.

*Prereq:* ECON 101

Basic concepts and economics principles related to markets for agricultural inputs and products. Overview of current marketing problems faced by farms and agribusinesses, farm and retail price behavior, structure of markets, food marketing channels, food quality and food safety, and the role of agriculture in the general economy. The implications of consumer preferences at the farm level. Introduction to hedging, futures, and other risk management tools.

**EDUC 204: Social Foundations of Education in the United States: Secondary**

(3-0) Cr. 3. F.S.SS.

Introduction to the historical and contemporary landscape of schooling in the United States. Emphasis is placed on topics and tensions in the relationship between school and society (e.g. equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching and learning at the secondary level in public schools. For prospective teachers in an ISU Secondary Educator Preparation program; open to students who are considering teaching and/or work in education as a career path.

**EDUC 205: Social Foundations of Education in the United States: Early Childhood and Elementary Education**

Cr. 3. F.S.

Introduction to the historical and contemporary landscape of schooling in the United States. Emphasis on topics and tensions in the relationship between school and society (e.g., equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching and learning in public schools. Students in K-12 education, secondary, education, or a non-education major should take EDUC 204.

**EDUC 219: Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors**

Cr. 1. F.S.

*Prereq: Students seeking teacher licensure in Family and Consumer Sciences, History, Mathematics, Science and World Language and Cultures in grades 5-12.*

Overview of mathematics, science, family and consumer sciences and history, and world language and cultures secondary education (grades 5-12), teacher licensure requirements in Iowa and other states. Program and career planning. Offered on a satisfactory-fail basis only.

**ENGL 099S: Strategies for Nonnative Speakers of English: Academic Speaking and Pronunciation**

Cr. 0. F.S.

Open to all interested international students.

**ENGL 101B: English for Native Speakers of Other Languages: Academic English**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam*

For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 101C: English for Native Speakers of Other Languages: Academic English II--Undergraduates**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam.*

For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 150: Critical Thinking and Communication**

(3-0) Cr. 3. F.S.SS.

Application of critical reading and thinking abilities to topics of civic and cultural importance. Introduction of basic oral, visual, and electronic communication principles to support writing development. Initiation of communication portfolio. Concurrent enrollment in LIB 160 is recommended.

**ENGL 201: Introduction to Literature**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Introduction to the diversity of literary texts. Students will explore work across different genres (drama, poetry, short fiction, the novel) and traditions (Indigenous, postcolonial, global, British, American). Recommended for nonmajors.

**ENGL 214: Introduction to Technical Communication**

Cr. 3. F.

*Prereq: ENGL 150*

A broad introduction to the culture of professional work as a technical communicator, with particular emphasis on principles and best practices for developing and managing technical information and digital media. Examination of user-centered design, the history of the discipline, cross-cultural communication, and the ethics of communicating complex information to lay audiences. Study and practice of team-based collaboration, project management, and technical editing.

**ENGL 225: Survey of British Literature to 1800**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Survey of British Literature from its beginnings to 1800. Representative works studied in their historical, cultural, and literary contexts that span nearly 900 years of shifts in religious, political, ethnic, and philosophical cultures.

**ENGL 226: Survey of British Literature since 1800**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Representative works studied in their historical, cultural, and literary contexts, including attention to the impact and legacy of the British empire on its former colonies, i.e., postcolonial literature.

**ENGL 237: Survey of Film History**

(2-3) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Survey of U.S. and international film history from its beginnings in the late nineteenth century to the present. Class meets for two hours per week for lecture and discussion. Lab meets for up to three hours per week for film screenings.

**ENGL 240: Introduction to American Indian Literature**

(Cross-listed with AM IN). (3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Survey of American Indian Literature of varying genres, including fiction, non-fiction, poetry, film, drama, and media. Focuses on interdisciplinary approaches to American Indian cultural, social, and environmental issues.

**ENGL 250: Written, Oral, Visual, and Electronic Composition**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 150; credit or concurrently enrollment in LIB 160; Sophomore classification or above*

Analyzing, composing, and reflecting on written, oral, visual, and electronic (WOVE) discourse within academic, civic, and cultural contexts. Emphasis on supporting a claim and using primary and secondary sources. Continued development of communication portfolio. The University requires a minimum grade of C in ENGL 250 to meet the Communication Proficiency graduation requirement; some majors/degree programs may set higher standards.

**ENGL 275: Analysis of Popular Culture Texts**

(Cross-listed with SP CM). (3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in ENGL 250*

Analysis of how information and entertainment forms persuade and manipulate audiences. Study of several forms that may include newspapers, speeches, television, film, advertising, fiction, and magazines. Special attention to verbal and visual devices.

**ENGR 160: Engineering Problems with Computer Applications Laboratory**

(2-2) Cr. 3. F.S.SS.

*Prereq: MATH 143 or satisfactory scores on mathematics placement examinations*

Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, statistics and engineering economics. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. (The honors section includes application of programming to mobile robotics). Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**ENT 201: Introduction to Insects**

(2.7-0) Cr. 1. F.S.SS.

Biological and ecological aspects of insects. Offered online only. 5 weeks.

**ENT 211: Insects and Society**

(2.7-0) Cr. 2. F.S.

*Prereq: ENT 201*

The importance of insects in human well-being. Insect-human interactions. Primarily for non-science and non-agriculture majors. Offered online only. 11 weeks.

**ENT 214: Insects in Forensic Science**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to the use of insects as evidence in court and how they can assist in solving crimes. Topics covered include basic insect biology, systematics, behavior, with emphasis on applications of forensic entomology.

**ENT 220: Introduction to Forensic Science**

(Cross-listed with C J). (3-0) Cr. 3. S.

Study of fundamental forensic science techniques and procedures covering types of physical, chemical, and biological evidence and how this information is used in the legal system. Assessment of crime scenes and various forensic specialties will be introduced.

**ENV S 101: Environmental Geology: Earth in Crisis**

(Cross-listed with GEOL). (3-0) Cr. 3. F.S.SS.

Exploration of the interactions between humans and the geologic environment, and the consequences of those interactions, on local to global scales. Discussion of water, soil, mineral, and energy resources, pollution, climate change, and natural hazards such as earthquakes, volcanism, mass wasting, and flooding.



**ENV S 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, NREM). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**ENV S 173: Environmental Biology**

(Cross-listed with BIOL). (3-0) Cr. 3. F.S.

An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment. Discussions of human population growth, biodiversity, sustainability, resource use, and pollution. Does not satisfy biology major requirements.

**ENV S 201: Introduction to Environmental Issues**

(Cross-listed with BIOL, ENSCI). (2-0) Cr. 2. F.

Discussion of current and emerging environmental issues such as human population growth, energy use, loss of biodiversity, water resources, and climate change.

**EVENT 171: Introduction to Event Management**

(3-0) Cr. 3. F.S.

Overview of the event management industries. Techniques and procedures required for designing and implementing successful events.

**FRNCH 101: Elementary French I**

(4-0) Cr. 4. F.SS.

Beginning level development of reading, writing, listening comprehension, and speaking in French, within the context of French culture.

**FRNCH 201: Intermediate French I**

(4-0) Cr. 4. F.

*Prereq: FRNCH 102*

Intermediate level development of reading, writing, listening comprehension, and speaking in French within the context of French culture.

Meets International Perspectives Requirement.

**FS HN 101: Food and the Consumer**

(3-0) Cr. 3. F.S.SS.

The food system from point of harvest to the consumption of the food by the consumer. Properties of food constituents. Protection of food against deterioration and microbial contamination. Introduction of foods into the marketplace. Processes for making various foods. Government regulations. Use of food additives. Current and controversial topics. High school biology and chemistry or 3 credits of college level biology and chemistry recommended.

**FS HN 167: Introductory Human Nutrition and Health**

(3-0) Cr. 3. F.S.SS.

Understanding and implementing present day knowledge of nutrition. The role of nutrition in the health and well being of the individual and family. High school biology or 3 credits of biology recommended.

**FS HN 220: American Food and Culture**

(3-0) Cr. 3. F.S.

American cuisine reflects the history of the U.S. It is the unique blend of diverse groups of people from around the world, including indigenous Native American Indians, Africans, Asians, Europeans, Pacific Islanders, and South Americans. Explore factors that impact the American Cuisine of today including diverse ethnic and cultural group influences, historical events related to food diversity in the U.S., and agriculture and industrial impacts on food production. Practical knowledge and basic food preparation techniques related to the U.S. food system and trends. Class sessions will include lectures, class discussions and Tasting Immersion activities.

**GEOL 100: How the Earth Works**

(3-0) Cr. 3. F.S.SS.

How does the earth work, what is it made of, and how does it change through time? Plate tectonics, Earth materials, landforms, structures, climate, and natural resources. Emphasis on the observations and hypotheses used to interpret earth system processes. Students may also enroll in Geol 100L.

**GEOL 100L: How the Earth Works: Laboratory**

(0-2) Cr. 1. F.S.

*Prereq: GEOL 100*

Students will gain understanding of how Earth processes affect their lives and how they affect the Earth, and of the complex nature of the Earth and its processes. They will gain a deep knowledge of the methods used to understand the time scales and rates of Earth processes also through an applied research experience on groundwater and surface water.

**GEOL 101: Environmental Geology: Earth in Crisis**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.SS.

Exploration of the interactions between humans and the geologic environment, and the consequences of those interactions, on local to global scales. Discussion of water, soil, mineral, and energy resources, pollution, climate change, and natural hazards such as earthquakes, volcanism, mass wasting, and flooding.

**GEOL 105: Gems and Gemstones**

(2-0) Cr. 1. F.

Offered in second half of the semester. Introduction to gems and gemstones, physical and optical properties of gems and gemstones, explanation of where gems come from and how they are found, how to distinguish between synthetic and naturally occurring gems, how the value of gems are determined, and the history of famous gems.

**GEOL 108: Introduction to Oceanography**

(Cross-listed with ENV S). (3-0) Cr. 3. F.

Introduction to the study of oceans and the processes that helped shape them. A major focus is on how the oceans work, with special attention on geological, chemical, and biological processes. Ocean circulation and its influence on climate. Life of the oceans. Use and misuse of ocean resources. Anthropogenic impacts on the oceanic environment.

**GEOL 111: Geological Disasters**

(Cross-listed with ENV S). (1-0) Cr. 1. F.S.SS.

Introduction to the catastrophic geologic processes with the potential to devastate human populations that continue to expand into regions at greatest risk from geologic hazards. Selected case studies and discussion of plate tectonics, climate, and earth processes explain the driving forces behind natural hazards such as earthquakes, tsunamis, volcanic eruptions, landslides, and floods.

**GEOL 201: Geology for Engineers and Environmental Scientists**

(2-2) Cr. 3. F.

Introduction to Earth materials and processes with emphasis on engineering and environmental applications.

**GER 101: Elementary German I**

(4-0) Cr. 4. F.SS.

Beginning level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. For beginning-level learners who have little or no prior exposure to German.

**GER 201: Intermediate German I**

(4-0) Cr. 4. F.

*Prereq: GER 102*

Intermediate level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. Intensive review of basic grammar covered in the first-year German class (or equivalent high school courses) while exploring cultural topics and themes.

Meets International Perspectives Requirement.

**GLOBE 201: Introduction to Global Resource Systems**

(3-0) Cr. 3. F.S.

A systematic analysis of natural, physical, and socio-economic resources. Examine ways communities prioritize, save, use, and invest in community resources to address their needs and wants in a sustainable way, and the global implications of resource systems decisions. Assessed service-learning component.

**H S 105: First Aid and Emergency Care**

(1-2) Cr. 2. F.S.SS.

Discussion and application of the basic techniques of utilizing bloodborne pathogen safety measures, administering first aid and cardiopulmonary resuscitation. ARC layperson certification available.

**H S 110: Personal and Consumer Health**

(3-0) Cr. 3. F.S.

Physical, mental, emotional and social aspects of health as a basis for understanding and promoting health, and preventing poor health conditions. Study of personal responsibility on the long-term benefits of maintaining a high level of wellness and health. Identification and mitigation of negative lifestyle habits.

**H SCI 110: Orientation and Human Sciences Career Exploration**

(2-0) Cr. 2. F.S.

Orientation and adjustment to the university and college; review of policies and procedures; academic resources; and course selection and planning. Comprehensive approach to career development; intensive self-analysis; and in-depth examination of majors in Human Sciences. Required for all students declared as an Undecided major in the College of Human Sciences.

**H SCI 150: Dialogues on Diversity**

(1-0) Cr. 1. F.S.

An exploration of diversity within the context of the Iowa State University community through understanding human relations issues.

**HD FS 102: Human Development**

(3-0) Cr. 3. F.S.SS.

Overview of life-span developmental tasks (physical, cognitive, language, social, emotional) examined from various theoretical perspectives. Discussion of topics related to family diversity, individual/family health and well-being and reciprocal relationships as affected by external factors.

**HD FS 183: Personal Finance in Early Adulthood**

(1-0) Cr. 1. F.S.SS.

Introduction to basic concepts and budgeting practices for management of resources and prevention of financial problems commonly associated with college, including credit and student loans. Offered on a satisfactory-fail basis only.

**HD FS 223: Child Development and Health**

(3-0) Cr. 3. S.

Typical and atypical development of children prenatal through middle childhood. Examination of healthy development and potential impact of health issues in children. Discussion of influence of the family and society on development. Either HD FS 223 or HD FS 224, but not both, may be applied toward graduation.

**HD FS 239: Consumer Issues**

(3-0) Cr. 3. F.S.

Introduction to factors affecting consumer decisions of individuals and families, including housing, healthcare, and personal finances. Emphasis on accessibility and affordability, community contexts for families; and consumer protection, legislation and regulation, and consumer fraud.

Meets U.S. Diversity Requirement

**HD FS 240: Literature for Children**

(3-0) Cr. 3. F.S.

Evaluation of literature for children, including an emphasis on diversity and inclusion; cultural competence. Roles of literature in the overall development of children. Literature selection and use in the home and educational settings.

**HD FS 276: Human Sexuality**

(3-0) Cr. 3. F.S.SS.

Behavioral, biological, and psychological aspects of human sexuality within the social context of family, culture, and society. Role of sexuality in human development. Critical analysis of media and research.

Communication and decision-making skills relating to sexuality issues and relationships.

Meets U.S. Diversity Requirement

**HIST 201: Introduction to Western Civilization I**

(3-0) Cr. 3. F.

Western civilization from ancient Mediterranean world to 1500. Social and cultural developments; economic and political ideas and institutions; problems of historical change and continuity.

Meets International Perspectives Requirement.

**HIST 207: Chinese Civilization**

(3-0) Cr. 3.

Origins, development, decline and transformation of China from earliest times to 1911.

Meets International Perspectives Requirement.

**HIST 211: Ancient Empires: From Sargon to Caesar**

Cr. 3. F.S.

Development of empires in the Near East and Mediterranean from the Akkadians to the fall of Rome. Discussion of the Hittites, Assyrians, Persians, Athenians, Macedonians (including the conquests of Alexander the Great), Carthaginians, and Romans; examination of imperialism as well as the social, cultural, and economic consequences of empire.

Meets International Perspectives Requirement.

**HIST 221: Survey of United States History I**

(3-0) Cr. 3. F.

Colonial foundations: revolution, confederation, and constitution; nationalism and democracy; sectional disunity, Civil War, and reunion.

**HIST 280: Introduction to History of Science I**

(3-0) Cr. 3.

Ideas of nature from ancient Greece to the seventeenth-century scientific revolution.

Meets International Perspectives Requirement.

**HORT 121: Home Horticulture**

(3-0) Cr. 3. F.S.

Growing plants in and around the home including requirements for growing indoor plants, plant propagation, landscape design, and maintaining trees, lawns, flower, fruit, and vegetable gardens. Recitation includes demonstrations and hands-on activities that illustrate principles of designing, growing and maintaining plants for both indoor and outdoor gardens.

**HSP M 101: Introduction to the Hospitality Industry**

(3-0) Cr. 3. F.S.

Introduction to the foodservice, lodging, and tourism components of the hospitality industry. Background information, current issues, and future challenges in various segments of the industry.

**I E 148: Information Engineering**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143*

Development of information solutions for engineering problems.

Fundamentals of the software development process. Engineering computations and the human/computer interface. Data models and database development. Program connectivity and network applications.

Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**INTST 235: Introduction to International Studies**

(3-0) Cr. 3. F.SS.

Overview of international studies, emphasizing cultural, geographic, economic, and political characteristics of major world areas and nations. Meets International Perspectives Requirement.

**ITAL 107: Intensive Beginning Italian**

Cr. 4. F.S.

A communicative approach to grammar and vocabulary within the context of Italian culture for students whose native language is not Italian. Taught in Italian.

**JL MC 101: Mass Media and Society**

(3-0) Cr. 3. F.S.SS.

Communication theory models and their application to the mass media; the mass communication process; organization, characteristics and responsibilities of the mass media; media literacy process.

**JL MC 110: Orientation to Journalism and Communication**

(1-0) Cr. 1. F.S.

Orientation to professional and pre-professional opportunities, writing for the mass media and curriculum requirements in the Greenlee School. Basic media writing preparation. Offered on a satisfactory-fail basis only.

**JL MC 240: Principles of Journalism**

Cr. 3. F.S.

Analysis of journalism industry and specific audiences served by print, electronic, visual and digital media. Introduction to core values of journalism and guiding principles that encompass literacy, ethics, law, history, the economy and cultural and societal implications.

**JL MC 242: Visual Principles for Mass Communicators**

(3-0) Cr. 3. F.S.

Understanding and analysis of the visual message. Visual perception, visual communication theory, design syntax, design elements and how they are applied in mass communication.

**KIN 252: Introduction to the Discipline of Kinesiology**

(1-0) Cr. 1. F.S.

Relevant societal issues and research within the discipline of Kinesiology (the study of movement) are addressed.

**KIN 253: Orientation and Learning Community in Kinesiology and Health**

(1-0) Cr. 1. F.S.

Overview of ISU policies and procedures, academic advising operations, degree requirements, program of study planning, and campus resources. Students will have out-of-class activities and work with faculty, staff and mentors to explore careers in Kinesiology and complete assignments related to identification & development of their skills and interests. Department of Kinesiology students only. Offered on a satisfactory-fail basis only.

**L L S 112: Foundations of Learning and Productive Team Membership**

(2-0) Cr. 2. F.

Introduction to developing intentional learners and worthy team members. Learning as the foundation of human enterprise; intellectual curiosity; ethics as a personal responsibility; everyday leadership; effective team and community interactions including team learning and the effects on individuals; and growth through understanding self, demonstrating ownership of own learning, and internalizing commitment to helping others. Intentional mental processing as a means of enhancing learning. Interconnectedness of the individual, the community, and the world.

**LAS 101: Orientation for Open Option and Preprofessional Students**

(1-0) Cr. 1. F.

Introduction to all undergraduate colleges. Provides information about university resources and services, assists with a successful academic transition to the university, and helps initiate the process of identifying academic major(s) and eventual career paths. Required of all first-year students in Open Option and Preprofessional Programs. Offered on a satisfactory-fail basis only.

**LATIN 101: Elementary Latin I**

(3-0) Cr. 3. F.

Grammar and vocabulary of classical Latin, within the context of Roman culture; reading knowledge through texts adapted from classical authors.

**LD ST 122: Leading with Purpose**

(1-0) Cr. 1. F.S.

Designed for emerging student leaders. Basic leadership skills covering personal skills development, goal achievement, values-based behaviors and mission statement development.

**LD ST 270: Campus Leadership Development**

(3-0) Cr. 3. F.S.SS.

Introduce effective leadership practices for emerging leaders. Engage in experiential campus leadership opportunities.

**LIB 160: Introduction to College Level Research**

(1-0) Cr. 1. F.S.SS.

*Prereq: Completion of ENGL 101 requirement*

Eight-week course required for undergraduate degree. Provides a foundation for college level research. Students will develop the critical thinking skills necessary to successfully navigate the research process: developing a research question, searching strategically, evaluating sources, and using information ethically. To be taken as early as possible in the student's undergraduate career. See course descriptions of ENGL 150 and ENGL 250 for requirements related to LIB 160. Offered on a satisfactory-fail basis only.

**LING 119: Introduction to World Languages**

(Cross-listed with WLC). (3-0) Cr. 3.

Study of language diversity and the personal, social and political effects of diversity. Language families, attitudes toward language and language use, language and culture, multilingualism, foreign language learning, written codes, official languages, and language policy.

Meets International Perspectives Requirement.

**LING 120: Computers and Language**

(Cross-listed with ENGL). (3-0) Cr. 3.

Introduction to the use of linguistic knowledge in computer applications today and the basic computational techniques used in such applications. The development of these techniques throughout the history of computational linguistics. How the study of language has contributed to the advancement of technology and how certain computational problems have influenced the way linguists study language.

**M E 160: Mechanical Engineering Problem Solving with Computer Applications**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or MATH 145); credit or concurrent enrollment in MATH 165; M E major*

Introduction to the field of Mechanical Engineering through problem-solving in a range of topics including statics, mechanics of materials and thermo-fluids. Techniques to professionally present and communicate solutions. Use of MATLAB computer programming to aid problem solving, including curve fitting and graphing. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count toward graduation.

**M E 170: Engineering Graphics and Introductory Design**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143 or MATH 145 or satisfactory scores on mathematics placement assessments*

Integration of fundamental graphics, computer modeling, and engineering design. Applications of multiview drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process including written and oral reports. Freehand and computer methods. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**M S 101: Introduction to Military Science**

(1-0) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 101L*

Examines the role of a Cadet in the Army Reserve Officer Training Corps and a Lieutenant in the United States Army. The course explores a military culture whose ultimate success is determined by the character and proficiency of its' leaders. Instruction introduces students to the cultural heritage and history of the U.S. Army. Students will begin to understand the structure of the U.S. Army and how it functions as an organization and institution. The curriculum promotes the development of students' communication skills to enhance their ability to transmit ideas. The class examines how the Army's cultural values drive the development of leadership in the Officer Corps. Hands-on activities enable students to gain insight on the skills and abilities required of cadets and officers interacting with civilians and soldiers.

**M S 101L: Basic Leadership Laboratory I**

(0-2) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 101*

Uses basic military training, missions and scenarios to provide a hands-on method of developing confidence and leadership skills. Students observe and participate in the rotation through various levels of leadership positions at the platoon and squad level within the Army command structure. This concept provides a constant learning environment as they learn to communicate effectively and work as a team while assigned to positions at various levels within the organization. Marching, rifle firing, and tactical patrolling; students gain confidence through rappelling and construction/use of rope bridges; and increase professional knowledge in areas such as first aid, water survival, personal physical fitness, and land navigation. Teaching locations include the ISU Armory, Camp Dodge (National Guard Facility), Pammel Woods (ISU campus), and ISU fitness centers. Full participation in all events will be determined based on students' physical and medical eligibility.

**M S 150: Army Physical Readiness**

(0-3) Cr. 1. Repeatable. F.S.

This lab is designed to use basic military skills and instruction to develop confidence, leadership, and physical fitness. The team approach is utilized in the instruction and application of Army physical fitness requirements. Students will learn various Army physical fitness techniques as well as how to conduct physical fitness sessions. Teaching locations include Lied Recreation Center, Beyer Hall, State Gym as well as around campus. Full participation in all events will be determined based on students physical and medical eligibility.

**MATH 101: Orientation in Mathematics**

(1-0) Cr. 1. F.

A required orientation for all first-year and transfer students in mathematics. Provides information about campus resources and opportunities available to students, assists with transition to the University, and academic planning. Offered on a satisfactory/fail basis only. Offered on a satisfactory-fail basis only.

**MATH 104: Introduction to Probability**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment

Permutations, combinations, probability, expected value, and applications. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Either MATH 104 or MATH 150 may be counted toward graduation, but not both.

**MATH 105: Introduction to Mathematical Ideas**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment

Introduction to the use of basic mathematics to solve real-world problems in the areas of voting issues, measuring power in situations where people have different numbers of votes, apportionment, fair division, and elementary game theory. No prior background in politics or history is necessary for this course. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**MATH 140: College Algebra**

(3-1) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or concurrent enrollment in MATH 139

Coordinate geometry, quadratic and polynomial equations, functions, graphing, rational functions, exponential and logarithmic functions, inverse functions, quadratic inequalities, systems of linear equations. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**MATH 143: Preparation for Calculus**

(4-0) Cr. 4. F.S.

*Prereq:* Satisfactory performance on placement assessment or MATH 140

Preparation for MATH 160 or MATH 165. Functions, graphing, basic trigonometry, logarithms, exponentials. Emphasis on co-variational reasoning. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 143 and MATH 145 may count toward graduation.

**MATH 145: Applied Trigonometry**

(3-0) Cr. 3. F.S.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in MATH 140

Mathematical ideas regarding the conception of space. General trigonometry, with an emphasis on the calculation of lengths, areas, and angles. The Law of Sines and the Law of Cosines. Polar, cylindrical, and spherical coordinate systems. Conic sections and quadric surfaces. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 143 and MATH 145 may count toward graduation.

**MATH 150: Discrete Mathematics for Business and Social Sciences**

(2-1) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or concurrent enrollment in MATH 149

Linear equations and inequalities, matrix algebra, linear programming, discrete probability. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Either MATH 104 or MATH 150 may be counted toward graduation, but not both.

**MATH 160: Survey of Calculus**

(4-0) Cr. 4. F.S.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in (MATH 140 or MATH 143)

Analytic geometry, derivatives and integrals of elementary functions, simple differential equations, and applications. Will not serve as a prerequisite for MATH 265 or MATH 266. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151, MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 165: Calculus I**

(4-0) Cr. 4. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in MATH 143

Differential calculus, applications of the derivative, introduction to integral calculus. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151 or MATH 160 or the sequence MATH 165-MATH 166 may be counted towards graduation.



**MATH 166: Calculus II**

(4-0) Cr. 4. F.S.SS.

*Prereq: Minimum of C- in MATH 165 or satisfactory performance on placement assessments*

Integral calculus, applications of the integral, parametric curves and polar coordinates, power series and Taylor series. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151, MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 195: Mathematics for Elementary Education I**

(2-2) Cr. 3. F.S.

*Prereq: Satisfactory performance on placement assessment; Early or Elementary Education major*

Whole number operations through analysis of properties, theoretical and hands-on models, mathematical analysis of elementary students' thinking; standard and non-standard algorithms; structure of the decimal system; linear measurement; two- and three-dimensional measurement, shapes and spatial sense; number theory; algebra as it relates to elementary curricula/teaching profession. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Students in the College of Liberal Arts and Sciences may not count MATH 195 toward General Education Requirements.

**MATH 265: Calculus III**

(4-0) Cr. 4. F.S.SS.

*Prereq: Minimum of C- in MATH 166 or MATH 166H*

Geometry of space and vectors, multivariable differential calculus, multivariable integral calculus, vector calculus.

**MATH 267: Elementary Differential Equations and Laplace Transforms**

(4-0) Cr. 4. F.S.SS.

*Prereq: Minimum of C- in MATH 166 or MATH 166H*

Same as MATH 266 but also including Laplace transforms and power series solutions to ordinary differential equations. Credit for either MATH 267 or the MATH 266, 268 pair of courses, but not both, may be applied toward graduation. Credit for only one of the following courses may be applied toward graduation: MATH 267, MATH 266, MATH 269.

**MICRO 101: Microbial World**

(3-0) Cr. 3. F.

Introduction to the importance of viruses, bacteria, fungi, archaea and parasites both to humans and to the biosphere. Topics include past and present microbial impact on humans and society, ecology and diversity of microbes, biotechnology and microbial impact on the biosphere. Recommended: High School Biology.

**MICRO 201: Introduction to Microbiology**

(2-0) Cr. 2. F.S.

*Prereq: One BIOL course except BIOL 110, BIOL 111, BIOL 112, BIOL 173, BIOL 201, BIOL 307*

Selected topics in microbiology with emphasis on the relationship of microorganisms to human and animal health, agricultural technology, and the environment. With written petition to the chair of the supervisory committee, students who obtain a grade of B or better may substitute 201 for Micro 302 in advanced courses.

**MICRO 201L: Introductory Microbiology Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for non-microbiology majors. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

**MTEOR 107: Severe and Hazardous Weather**

(2-0) Cr. 1. F.

Understanding of atmospheric processes that play a role in creating severe and hazardous weather. Focus on thunderstorms, tornadoes, hurricanes, floods, blizzards, ice storms, and temperature extremes. Impacts on lives and property.

**MTEOR 140: Climate and Society**

(Cross-listed with AGRON, ENV S, GEOL). Cr. 3. F.S.

The climate system of our planet. How nature and our actions alter the existing energy balance leading to climate change. Past climates on our planet. The influence of climate on society and resource availability during the Holocene (~ 11,000 years ago to present) with focus on changes post industrial revolution. Significant climate events that have altered our way of life in the past. Projected changes in future climate and potential impacts on society, environment and resources. Adaption to and mitigation of climate change.

Meets International Perspectives Requirement.

**MTEOR 206: Introduction to Weather and Climate**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

Basic concepts in weather and climate, including atmospheric measurements, radiation, stability, precipitation, winds, fronts, forecasting, and severe weather. Applied topics include global warming, ozone depletion, world climates and weather safety.

**MUSIC 101: Fundamentals of Music**

(1-2) Cr. 2. F.S.

Notation, recognition, execution and analysis of scales, intervals, triads, and rhythm; key signatures; time signatures; transposition. Open to non-majors only. Ability to read elementary musical notation required.

**MUSIC 102: Introduction to Music Listening**

(3-0) Cr. 3. F.S.SS.

Expansion of the music listening experiences for the general student through greater awareness of differences in techniques of listening, performance media, and materials of the art. The course focuses on the elements of music: rhythm, melody, harmony, form, and style, and how these elements are used in musics of different cultures and time periods. Ability to read or perform music not required. Meets International Perspectives Requirement.

**MUSIC 111: Wind Ensemble**

(0-3) Cr. 1. Repeatable. F.S.

Emphasis on significant extended compositions for wind and percussion instruments. Performances include formal concerts on campus and the annual tour. Open to all students by audition.

**MUSIC 112: Concert Band**

(0-2) Cr. 1. Repeatable. F.S.

Repertoire includes the broad spectrum of band music. Two concerts are presented each semester. Open to students who have performed on a wind or percussion instrument in high school band or orchestra.

**MUSIC 113: Jazz Ensemble**

(0-2) Cr. 1. Repeatable. F.S.

Designed to explore various styles and trends in contemporary jazz. Open to all students by audition.

**MUSIC 114A: Marching and Pep Bands: Marching Band**

(0-5) Cr. 1. Repeatable. F.

Membership determined by audition and band application. Auditions held for woodwind, brass, percussion, flag, and twirler positions. Presentation of pre-game and half time shows at each home football game; additional performances are also scheduled on and off campus. Audition information is listed on the band website ([www.music.iastate.edu/org/marching](http://www.music.iastate.edu/org/marching)). Students may not be concurrently enrolled in MUSIC 114A and 114C.

**MUSIC 115: Symphonic Band**

(0-3) Cr. 1. Repeatable. F.S.

Stresses high quality wind literature. Performances include formal concerts on campus. Open to all students by audition.

**MUSIC 118: Applied Music: Non-majors**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Applied music for the general student. Audition required.

**MUSIC 141: Lyrica Ensemble**

(0-3) Cr. 1. Repeatable. F.S.

Large chorus; emphasis on wide variety of literature and singing sounds from around the world. Includes fundamental voice and choral skills. Campus concerts each semester. Open to all treble voice students by audition.

**MUSIC 151A: University Chorus: Cantamus Women's Choir**

(0-3) Cr. 1. Repeatable. F.S.

Large chorus; emphasis on adventurous, contemporary programming. Advanced skills required. Campus concerts each semester, some in conjunction with orchestra. Open to all treble voice students by audition.

**MUSIC 151B: University Chorus: Statesmen Men's Choir**

(0-3) Cr. 1. Repeatable. F.S.

Advanced skills required, high quality literature. Campus concerts each semester, some concerts in conjunction with orchestras. Men's and women's choirs separately and in combination. Open to all students by audition.

**MUSIC 161: Iowa State Singers**

(0-5) Cr. 1. Repeatable. F.S.

Concert choir specializing in performance of advanced music literature, Renaissance through contemporary. Campus concerts, annual spring tour. Open to all students by audition.

**MUSIC 181: Symphony Orchestra**

(0-4) Cr. 1. Repeatable. F.S.

Reading, preparation, and performance of standard repertoire. Five or six concerts annually plus occasional off-campus appearances. Open to all students by audition.

**N S 111: Introduction to Naval Science**

(3-0) Cr. 3. F.

Introduction to the organization, regulations, and capabilities of the US Navy, with emphasis on mission and principal warfare components.

**NREM 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**P R 220: Principles of Public Relations**

(3-0) Cr. 3.

Introduction to public relations in business, government and non-profit organizations; functions, processes, and management; ethics, public opinion and theory.

**PHIL 201: Introduction to Philosophy**

(3-0) Cr. 3. F.S.SS.

It has been rumored that the unexamined life is not worth living. Philosophy is an attempt to begin examining life by considering such questions as: What makes us human? What is the world ultimately like? How should we relate to other people? Is there a god? How can we know anything about these questions? Understanding questions of this kind and proposed answers to them is what this course is all about.

**PHIL 206: Introduction to Logic and Scientific Reasoning**

(3-0) Cr. 3. F.

Basic principles of critical reasoning and argument evaluation. A consideration of basic forms of argumentation in science and everyday life. Application to contemporary issues and controversies.

**PHIL 207: Introduction to Symbolic Logic**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

Introduction to fundamental logical concepts and logical symbolism. Development of natural deduction through first order predicate logic with identity. Applications to arguments in ordinary English and to philosophical issues. Linguistics majors should take LING/PHIL 207 as early as possible.

**PHIL 230: Moral Theory and Practice**

(3-0) Cr. 3. F.S.SS.

Investigation of moral issues in the context of major ethical theories of value and obligation; e.g., punishment, abortion, economic justice, job discrimination, world hunger, and sexual morality. Emphasis on critical reasoning and argument analysis.

**PHIL 235: Ethical Issues in a Diverse Society**

(3-0) Cr. 3. F.S.

This course will examine a range of arguments on diversity issues. Topics will include: the social status of women, the moral status of sexuality and homosexuality, the nature and role of racism in contemporary society, the relationship between biology, gender roles and social status, and various proposals for change from a variety of political perspectives.

Meets U.S. Diversity Requirement

**PHYS 050: Preparation for Introductory Physics**

Cr. 0. F.S.

An in#depth active learning experience designed to impart the fundamental concepts and principles of physics, with an emphasis on applied mathematical techniques and logical thinking. For students intending to enroll in classical physics (PHYS 231/232) who have not taken high school physics, who have not had a high school college preparatory physics course, or who need a review of physics problem solving and physics concepts. 1 year high school algebra recommended. Credit for Phys 50 does not count toward graduation.

**PHYS 101: Physics for the Nonscientist**

(3-0) Cr. 3. F.S.

Survey of the principal areas of both classical and modern physics. Emphasis on the nature of the physical universe and the application of physical principles to life in the modern world. Not suitable to meet a general physics requirement for natural science majors.

**PHYS 115: Physics for the Life Sciences**

(4-0) Cr. 4. F.S.

Emphasis on basic physics principles applied to biological problems. Topics include mechanics, fluids, thermodynamics, heat, light, sound, electricity and magnetism. A coordinated laboratory, Physics 115 laboratory is available. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 131: General Physics I**

(4-0) Cr. 4. F.S.SS.

General background in physical concepts, principles, and methods for those who do not plan advanced study in physics or engineering. Mechanics, fluids, heat and thermodynamics, vibrations, waves, sound. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 131L: General Physics I Laboratory**

(0-2) Cr. 1. F.S.SS.

Laboratory experiments in elementary kinematics, work and energy, conservation laws, rotational motion, waves and fluids. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 132: General Physics II**

(4-0) Cr. 4. F.S.SS.

*Prereq: PHYS 111 or PHYS 131*

General background in physical concepts, principles, and methods for those who do not plan advanced study in physics or engineering. Electricity and magnetism, ray and wave optics, topics in modern physics.

**PHYS 132L: General Physics II Laboratory**

(0-2) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in PHYS 112 or PHYS 132*

Laboratory experiments in Electricity and Magnetism, Wave and Optics.

**PHYS 231: Introduction to Classical Physics I**

(4-0) Cr. 4. F.S.SS.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

For engineering and science majors. 3 hours of lecture each week plus 3 recitations every two weeks. Elementary mechanics including kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation. Heat, thermodynamics, kinetic theory of gases; waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 231L: Introduction to Classical Physics I Laboratory**

Cr. 1. F.S.SS.

*Prereq: MATH 165; credit or concurrent enrollment in PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H*

Laboratory experiments in elementary kinematics, work and energy, conservation laws, and rotational motion. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 232: Introduction to Classical Physics II**

(4-0) Cr. 4. F.S.SS.

*Prereq: MATH 166; PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H*

3 hours of lecture each week plus 1 recitation each week. Fluid dynamics. Electric forces and fields. Electrical currents; DC circuits. Magnetic forces and fields; LR, LC, LCR circuits; Maxwell's equations; wave optics.

**PHYS 232L: Introduction to Classical Physics II Laboratory**

(0-2) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in PHYS 222 or PHYS 222H or PHYS 232 or PHYS 232H or PHYS 242 or PHYS 242H*

Laboratory experiments in fluid dynamics, electric forces and fields, electrical currents, DC circuits, magnetic forces and fields, and wave optics.

**PHYS 241: Principles and Symmetries in Classical Physics I**

(4.5-1) Cr. 5. F.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

Covers all of mechanics; kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation, and extremum principles. Topics in kinetic theory, thermodynamics, waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**POL S 111: Introduction to American Government**

(3-0) Cr. 3. F.S.

Fundamentals of American democracy; constitutionalism; federalism; rights and duties of citizens; executive, legislative, and judicial branches of government; elections, public opinion, interest groups, and political parties.

**POL S 121: Introduction to International Politics**

(3-0) Cr. 3. F.S.

Dynamics of interstate relations pertaining to nationalism, the nation state; peace and war; foreign policy making; the national interest; military capability and strategy; case studies of transnational issues, such as population, food, energy, and terrorism.

Meets International Perspectives Requirement.

**POL S 125: Democracy and Dictatorship: Introduction to Comparative Politics**

(3-0) Cr. 3. F.S.

Interactions between governments and citizens in countries outside the US. Causes of democracy, dictatorship, and economic and social development.

Meets International Perspectives Requirement.

**PSYCH 101: Introduction to Psychology**

(3-0) Cr. 3. F.S.SS.

Fundamental psychological concepts derived from the application of the scientific method to the study of behavior and mental processes. Applications of psychology.

**PSYCH 102: Laboratory in Introductory Psychology**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in PSYCH 101*

Laboratory to accompany 101.

**PSYCH 111: Orientation to Psychology**

Cr. 1. F.S.

Program requirements and degree/career options. Required of psychology majors.

**PSYCH 131: Academic Learning Skills**

(1-0) Cr. 1. F.S.

Evidence-based approach to learning and applying academic skills such as time management, note-taking, reading, test preparation, goal setting and motivation, and well-being. Hybrid course structured in a team-based learning format.

**PSYCH 230: Developmental Psychology**

(3-0) Cr. 3. F.S.SS.

Life-span development of physical traits, cognition, intelligence, language, social and emotional behavior, personality, and adjustment.

**PSYCH 250: Psychology of the Workplace**

(3-0) Cr. 3.

Survey of theories and research methods of psychology applied to the workplace. Consideration of employee selection, training, performance evaluation, leadership, work groups, employee motivation, job attitudes and behaviors, organizational culture, organizational development, human factors, and job design from the scientist-practitioner approach.

**PSYCH 280: Social Psychology**

(3-0) Cr. 3. F.S.SS.

Individual human behavior in social contexts. Emphasis on social judgments and decisions, attitudes, perceptions of others, social influence, aggression, stereotypes, and helping.

**RELIG 205: World Religions**

(Cross-listed with WLC). (3-0) Cr. 3. F.S.SS.

An introduction to religious studies – the academic study of religion.

Religions from around the world will be discussed, including their myths, rituals, beliefs, values, and social forms.

Meets International Perspectives Requirement.

**RELIG 210: Religion in America**

(3-0) Cr. 3. F.S.SS.

Introductory study of the major beliefs, practices, and institutions of American Judaism, Catholicism, Protestantism, and Islam with emphasis on the diversity of religion in America, and attention to issues of gender, race, and class.

Meets U.S. Diversity Requirement

**RELIG 332: Catholicism**

(3-0) Cr. 3. F.

An explanation of the beliefs, spirit, and practices of Roman Catholicism, including its understanding of God, sacramentality, the human person, and community, and its relationship to other forms of Christianity and other world religions.

**RUS 101: Introduction to Russian Language and Culture I**

(4-0) Cr. 4. F.

Introduction to the Russian language (focusing on the development of speaking, listening, reading and writing skills) and Russian culture.

**RUS 201: Intermediate Russian I**

(4-0) Cr. 4. F.

*Prereq: RUS 102*

Thorough review of grammar and growth of vocabulary. Selected readings. Continued use of the four basic skills.

Meets International Perspectives Requirement.

**S E 101: Software Engineering Orientation**

Cr. R.

Introduction to the procedures, policies, and resources of Iowa State University and the Software Engineering Program. Offered on a satisfactory-fail basis only.

**S E 185: Problem Solving in Software Engineering**

(2-2) Cr. 3.

*Prereq: Credit or concurrent enrollment in MATH 143 (or satisfactory scores on mathematics placement examinations)*

Introduction to software engineering and computer programming.

Systematic thinking process for problem solving in the context of software engineering. Group problem solving. Solving software engineering problems and presenting solutions through computer programs, written documents and oral presentations. Introduction to principles of programming, software design, and extensive practice in design, writing, running, debugging, and reasoning about programs.

Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count toward graduation.**SOC 115: Orientation to Sociology**

(1-0) Cr. 1. F.S.

Orientation to sociology. A familiarization with University and LAS College requirements and procedures. Occupational tracks and career options open to sociology; introduction to career planning. Recommended during first semester of freshman year, or as soon as possible after transfer into the department. Offered on a satisfactory-fail basis only.

**SOC 134: Introduction to Sociology**

(3-0) Cr. 3. F.S.SS.

Social interaction and group behavior with emphasis on the scientific study of contemporary U.S. society, including issues relating to socialization, inequality, and changing rural and urban communities.

Analysis of relationships among the institutions of family, religion, political participation, work, and leisure.

**SOC 219: Families and Intimate Relationships**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Exploration of families and intimate relationships using a sociological perspective, with the goal to help students make informed and intentional choices in their relationships across the life course. Topics covered include family definitions and theories, sexuality, singlehood, dating, cohabitation, marriage, parenting, divorce, stepfamilies, and aging. Relationship quality, communication, conflict, and work-life balance will also be examined, as well as differences in family dynamics by gender, race and ethnicity, and class.

**SOC 235: Social Problems and American Values**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Sociological concepts, theories and methods to analyze the causes and consequences of social problems. Social problems discussed may include crime, substance abuse, income inequalities, discrimination, poverty, race relations, health care, family issues, and the environment. How American culture and values shape societal conditions, public discourse and policy.

**SOC 241: Youth and Crime**

(Cross-listed with C J). (3-0) Cr. 3. F.

An examination of delinquency that focuses on the relationship between youth as victims and as offenders, social and etiological features of delinquency, the role of the criminal justice system, delinquents' rights, and traditional and alternative ways of dealing with juvenile crime.

**SP CM 110: Listening**

(3-0) Cr. 3. F.S.

Theory, principles, and competency development in comprehensive, therapeutic, critical, consumer, and appreciative listening. The impact of listening in relationships and partnerships.

**SP CM 212: Fundamentals of Public Speaking**

(3-0) Cr. 3. F.S.SS.

Theory and practice of basic speech communication principles applied to public speaking. Practice in the preparation and delivery of extemporaneous speeches.

**SP CM 216: America Speaks: Great Speakers and Speeches in US History**

Cr. 3.

Survey of great speeches examined within their political and cultural contexts. Analysis of the rhetorical strategies of diverse speakers with an emphasis on texts from social movements in the United States.

**SP CM 275: Analysis of Popular Culture Texts**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in ENGL 250*

Analysis of how information and entertainment forms persuade and manipulate audiences. Study of several forms that may include newspapers, speeches, television, film, advertising, fiction, and magazines. Special attention to verbal and visual devices.

**SP ED 250: Education of the Exceptional Learner**

(3-0) Cr. 3. F.S.

*Prereq: EDUC 205*

An overview of students with diverse learning needs, including students with disabilities, English Learners, students who are at risk, and gifted learners. Emphasis is on early identification; educational programming and implications; and legal foundations. Includes Individual Education Programs, Least Restrictive Environment, Functional Behavioral Assessment, and Behavior Intervention Plans.

**SPAN 097: Accelerated Spanish Review**

(3-2) Cr. 0. F.S.

For students who require additional review at the first year (101-102) level. Course components include a compact review of 101 and the essential elements of 102. Course completed with a passing grade fulfills the LAS foreign language requirement. Not recommended for students who wish to continue language at the second year (201-202) level without completing 102. Two years but less than three years of high-school Spanish recommended.

**SPAN 101: Elementary Spanish I**

(4-0) Cr. 4. F.SS.

A communicative approach to grammar and vocabulary within the context of Hispanic culture. For students whose native language is not Spanish.

**SPAN 102: Elementary Spanish II**

(4-0) Cr. 4. S.SS.

*Prereq: SPAN 101 or SPAN 97 or placement by departmental exam*

Continuation of Spanish 101. A communicative approach to grammar and vocabulary within the context of Hispanic culture. For students whose native language is not Spanish.

Meets International Perspectives Requirement.

**SPAN 201: Intermediate Spanish I**

(4-0) Cr. 4. F.

*Prereq: SPAN 102 or placement by departmental exam*

Intensive review of basic grammar and conversation. For students whose native language is not Spanish. Practice in oral and written communication. Development of fluency with idiomatic expressions. Selected readings on culture and literature.

Meets International Perspectives Requirement.



**SPAN 297: Intensive Intermediate Spanish**

(4-0) Cr. 4. F.S.

*Prereq: SPAN 201 or placement by departmental exam*

Bridge course between 200- and 300-level Spanish courses that focuses on application of advanced grammatical concepts within the context of Hispanic culture. Accelerated review of SPAN 201 and SPAN 202 designed for students who want to continue at the 300 level. Taught in Spanish for students whose native language is not Spanish. Meets International Perspectives Requirement.

**SPAN 303: Spanish Conversation and Composition**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 202 or placement by departmental exam*

Intensive oral practice and improvement of oral proficiency. Application of specific grammatical concepts for development of conversational and writing skills within the context of Hispanic culture. Taught in Spanish. Meets International Perspectives Requirement.

**STAT 101: Principles of Statistics**

(3-2) Cr. 4. F.S.SS.

Statistical concepts in modern society; descriptive statistics and graphical displays of data; the normal distribution; data collection (sampling and designing experiments); elementary probability; elements of statistical inference; estimation and hypothesis testing; linear regression and correlation; contingency tables. 1 1/2 years of high school algebra required. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

**STAT 104: Introduction to Statistics**

(2-2) Cr. 3. F.S.SS.

Statistical concepts and their use in science; collecting, organizing and drawing conclusions from data; elementary probability; binomial and normal distributions; regression; estimation and hypothesis testing. For students in the agricultural and biological sciences. 1 1/2 years of high school algebra required. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

**THTRE 106: Introduction to the Performing Arts**

(3-0) Cr. 3. F.S.

An audience oriented, broad-based, survey of the performing arts which emphasizes theatre and includes segments on television, radio and podcasts, film, dance, music, and video games.

**THTRE 110: Theatre and Society**

(3-0) Cr. 3. F.S.

An introduction to Theatre focusing on its relationship with society throughout history.

**THTRE 251: Acting Foundations**

(3-0) Cr. 3. F.S.

Theory and practice in fundamentals of acting.

**TSM 115: Solving Technology Problems**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 140 or higher*

Solving technology problems using modern hardware and software tools for data-driven solutions. Problem solving cycle, unit conversion, unit factor method, SI and engineering units, significant figures, data collecting and cleaning, error analysis, data visualization, curve fitting, and computer coding fundamentals (data types, flow control, I/O handling, visualization, debugging). Strong emphasis on critical thinking, systematic problem solving, and effective communication.

**TSM 116: Introduction to Design in Technology**

(2-2) Cr. 3. F.S.

Use of parametric solid modeling software to create three dimensional solid models and document parts and assemblies. Includes national and international standards for documentation, design projects, and teamwork. Rapid prototyping design creation, 3D printing, assemblies, rendering, and detailing technical drawings.

**U ST 104: Personal Career Development**

(2-0) Cr. 2. F.S.

Comprehensive approach to personal career development providing students with the skills and structure to make informed choices about their major and career path. Self-exploration of interests, skills, values, and personality as related to the world of work using a variety of techniques; exploration of majors and occupations; model for major and career decision-making and career goal implementation; exposure to effective job search and interviewing skills and resources.

**US LS 211: Introduction to U.S. Latino/a Studies**

(3-0) Cr. 3. F.S.

History and current lives of the Latino/a peoples in the United States, including Mexican, Cuban, Puerto Rican, Dominican, and South and Central Americans, as well as information specific to Iowa Latino/as, will be covered. Through readings, class discussions, writing assignments, and guest speakers, students will acquire accurate information and a solid understanding of the US Latino/a population and cultural perspectives. Elements of Latino/a culture to be covered include historical, sociological, educational, psychological, economic, and political facets.

Meets U.S. Diversity Requirement

**WGS 160: Gender Justice**

(2-0) Cr. 1. F.S.

Half semester course. Examines the socialization process in the United States and how our perspectives are formed. An introduction to patriarchy, sexism, and ally development are explored. Skills to enhance communication and understanding among women and men will be developed. Offered on a satisfactory-fail basis only.

**WGS 201: Introduction to Women's and Gender Studies**

(3-0) Cr. 3.

Introduction to the interdisciplinary field of Women's and Gender Studies. Contemporary status of women in the U.S. and worldwide from social, economic, historical, political, philosophical and literary perspectives. Analysis of intersection of gender, race, class, and sexuality. Subject matter includes work, health, sexuality, and violence. Foundation for the other courses in the program.

Meets U.S. Diversity Requirement

**W F S 278: Introduction to Global Film**

(3-0) Cr. 3. F.

Introduction to the cinema of non-English speaking regions and cultures of the world through representative subtitled films, lectures, and readings. Topics vary according to faculty interest. Emphasis on selected national cinemas and film as a mode of cultural expression as well as on diverse cultural contexts of cinema.

Meets International Perspectives Requirement.

**WLC 210: Introduction to Asian American Studies**

(Cross-listed with ANTHR). (3-0) Cr. 3.

An interdisciplinary and chronological examination of Asian American immigration experiences from the early 19th century to the 21st century. Focus on how these immigration histories are accompanied by changing racial constructions. Discussion of racial stereotyping, the model minority myth, identity development, and efforts for social justice.

Meets U.S. Diversity Requirement

**Credits**

The academic value of each course is stated in semester credits.

Each credit is normally earned by attending one (50-minute) hour of lecture or recitation per week for the entire semester, or by attending a laboratory or studio period of two or three hours per week. As a guideline, undergraduate students typically will be expected to spend two hours in preparation outside of class for each lecture or recitation hour; additional outside work may be required for laboratory or studio classes.

**Contact Hours**

Each course states the number of semester credits assigned to the course, preceded in parentheses by the number of hours in class (contact hours) expected of the student. The first of the two contact-hour numbers indicates the number of lecture or recitation class hours per week for

the semester. The second is the number of laboratory or studio hours required per week. Laboratory and studio hours may include some time devoted to lectures and recitations. For example, COM S 227 Introduction to Object-oriented Programming is listed as (3-2) Cr. 4. In that case, the course is 4 semester credits, 3 hours of lecture and two hours of laboratory each week.

**Semester Offering**

The expected term a course is to be offered is indicated by the abbreviations F (Fall) S (Spring) SS (Summer). The notations are for planning purposes and *do not* guarantee a course will be offered in a particular term. Always check the Schedule of Classes (<http://classes.iastate.edu>) for availability and specific offering times.

# PLAN OF STUDY - SOAR IN 4

## Four Year Graduation Guarantee

Iowa State University's Soar in 4: Four-Year Graduation Guarantee provides the opportunity for students to take a proactive approach towards completing their undergraduate degree in four years (or eight semesters). Through careful planning with their academic advisors, students can complement their undergraduate degree with experiences such as study abroad, internship, and service learning. By graduating in four years, students can reduce their tuition costs and accelerate their entry into the job market or advanced education compared to students who take more than eight semesters to graduate. The program encourages students to work collaboratively with their academic advisor to make strategic academic decisions about which courses to take each semester.

Students wanting to graduate in four years under the Soar in 4: Four-Year Graduation Guarantee are expected to:

- Keep in close contact with their Iowa State academic advisor, who will guide students' academic decisions and keep students up-to-date with university policies and procedures.
- Take required courses at the times they are available.
- Maintain student registration at ISU during off-campus experiences.
- Register for classes promptly and monitor academic progress on a regular basis by reviewing the degree audit with their advisor.

Iowa State University will provide the academic advising services and degree-audit mechanisms to assist students in accurately monitoring progress toward graduation. ISU is also responsible for providing class space in the courses required for the student's respective major in order to complete a bachelor's degree within eight consecutive semesters.

Additional information about the Four-Year Graduation Guarantee can be found at:

<http://www.provost.iastate.edu/academic-programs/soarin4> (<http://www.provost.iastate.edu/academic-programs/soarin4/>)

## Four-year (eight-semester) templates for ISU programs of study

Iowa State University offers over 100 majors in six undergraduate colleges. All but two programs, architecture and landscape architecture, may be completed in four years. ISU's bachelor degree programs require from 120 to 144 credits; therefore, students must average between 15 and 18 credits per semester. To assist students in creating their own personal four-year academic plans, eight-semester templates are provided for all programs of studies covered by the Soar in 4 program.

- Agricultural and Life Sciences Education, B.S. - communications option
- Agricultural and Life Sciences Education, B.S. - teacher certification option
- Agricultural and Rural Policy Studies, B.S.
- Agricultural Business, B.S.
- Agricultural Studies, B.S.
- Agricultural Systems Technology, B.S. - Agricultural and Biosystems Management option
- Agricultural Systems Technology, B.S. - Machine Systems option
- Agronomy, B.S.
- Animal Ecology, B.S. - fisheries and aquatic sciences
- Animal Ecology, B.S. - interpretation of natural resources option
- Animal Ecology, B.S. - Pre-vet & wildlife care option
- Animal Ecology, B.S. - wildlife option
- Animal Science, B.S.
- Animal Science, B.S. - pre-veterinary medicine
- Biochemistry, B.S. - option 1
- Biochemistry, B.S. - option 2
- Biology, B.S.
- Culinary Food Science, B.S.
- Dairy Science, B.S. - general
- Dairy Science, B.S. - pre-veterinary medicine option
- Diet and Exercise, B.S./M.S.
- Dietetics, B.S.
- Environmental Science, B.S.
- Food Science, B.S.
- Forestry, B.S. - Forest Ecosystem Management option
- Genetics, B.S.
- Global Resource Systems, B.S.
- Horticulture, B.S. - Greenhouse Plant Production option
- Horticulture, B.S. - Horticulture Food Crop Production and Management option
- Horticulture, B.S. - Landscape Design, Installation, and Management
- Horticulture, B.S. - Public Horticulture option
- Horticulture, B.S. - Horticulture Research option
- Horticulture, B.S. - Turfgrass Management option
- Industrial Technology, B.S. - manufacturing option
- Industrial Technology, B.S. - occupational safety option
- Microbiology, B.S.
- Nutritional Science, B.S. - nutritional and wellness option
- Nutritional Science, B.S. - pre-health professional & research option

- Accounting, B.S.
- Actuarial Science, B.S.
- Business Analytics, B.S.
- Business Economics, B.S.
- Entrepreneurship, B.S.
- Finance, B.S.
- Healthcare Management, B.S.
- Human Resource Management, B.S.
- Management, B.S.
- Management Information Systems, B.S.
- Marketing, B.S.
- Supply Chain Management, B.S.
- Architecture, B.Arch.
- Art and Design, B.A., Art and Culture Concentration
- Art and Design, B.A., Visual Culture Studies Concentration
- Community and Regional Planning, B.S.
- Graphic Design, B.F.A.
- Industrial Design
- Integrated Studio Arts, B.F.A.
- Interior Design, B.F.A.
- Landscape Architecture, B.L.A.
- Aerospace Engineering, B.S.
- Agricultural Engineering, B.S. - ag power and machinery option
- Agricultural Engineering, B.S. - animal production systems engineering option
- Agricultural Engineering, B.S. - land and water resources engineering option
- Biological Systems Engineering, B.S. - ecological engr option
- Biological Systems Engineering, B.S. - food & bioprocess engr option
- Biological Systems Engineering, B.S. - open option
- Chemical Engineering, B.S.
- Civil Engineering, B.S. - environmental specialization
- Civil Engineering, B.S. -GENERAL Program
- Computer Engineering, B.S.
- Construction Engineering, B.S. building emphasis
- Construction Engineering, B.S. electrical emphasis
- Construction Engineering, B.S. heavy/highway emphasis
- Construction Engineering, B.S. mechanical emphasis
- Cyber Security Engineering, B.S.
- Electrical Engineering, B.S.
- Environmental Engineering, B.S.
- Industrial Engineering, B.S.
- Materials Engineering, B.S.
- Mechanical Engineering, B.S.
- Software Engineering, B.S.
- Apparel, Merchandising, and Design, B.S. - creative and technical design option
- Apparel, Merchandising, and Design, B.S. - merchandising retail analytics option
- Apparel, Merchandising, and Design, B.S. - product development for apparel and soft goods option
- Apparel, Merchandising, and Design, B.S. - fashion communications
- Culinary Food Science, B.S.
- Diet and Exercise, B.S./M.S.
- Dietetics, B.S.
- Early Childhood Education, B.S.
- Elementary Education, B.S.
- Event Management, B.S.
- Family and Consumer Sciences Education and Studies, B.S. - communications option
- Family and Consumer Sciences Education and Studies, B.S. - professional studies option
- Financial Counseling and Planning, B.S.
- Food Science, B.S.
- Hospitality Management, B.S.
- Human Development and Family Studies, B.S.-Advocacy, Administration, & Policy option
- Human Development and Family Studies, B.S.-Child Development & Guidance option
- Human Development and Family Studies, B.S.-Health, Well-being, & Prevention option
- Kinesiology and Health, B.S. - Community/Public Health
- Kinesiology and Health, B.S. - Exercise Science
- Kinesiology and Health, B.S. - Physical Activity and Health Promotion
- Kinesiology and Health, B.S. - Physical Education Teacher Education
- Kinesiology and Health, B.S. - Pre-Health Professions - Chiropractic
- Kinesiology and Health, B.S. - Pre-Health Professions - Dentistry
- Kinesiology and Health, B.S. - Pre-Health Professions - Human Medicine (Pharmacy)
- Kinesiology and Health, B.S. - Pre-Health Professions - Occupational Therapy
- Kinesiology and Health, B.S. - Pre-Health Professions - Optometry
- Kinesiology and Health, B.S. - Pre-Health Professions - Physical Therapy

- Kinesiology and Health, B.S. - Pre-Health Professions - Physician Assistant
- Nutritional Science, B.S. - Nutrition & wellness option
- Nutritional Science, B.S. - Pre-health professional & research option
- Advertising, B.A.
- Anthropology, B.A., B.S.
- Biochemistry, B.S.
- Bioinformatics and Computational Biology B.S.
- Biological/Pre-Medical Illustration, B.A.
- Biology, B.S.
- Biophysics, B.S.
- Chemistry, B.A.
- Chemistry, B.S.
- Climate Science, B.S.
- Communication Studies, B.A.
- Computer Science, B.A., B.S.
- Criminal Justice, B.A.
- Data Science, B.S.
- Earth Science, B.A., B.S.
- Economics, B.S.
- English, B.A. - English Education
- English, B.A., B.S.
- Environmental Science, B.S.
- Genetics, B.S.
- Geology, B.S.
- History, B.S.
- History, B.A.
- Journalism and Mass Communication, B.A., B.S.
- Linguistics, B.A.
- Mathematics, B.S.
- Meteorology, B.S.
- Music, B.A.
- Music, B.Mus. - Instrumental: K-12 Certification
- Music, B.Mus. - organ
- Music, B.Mus. - piano
- Music, B.Mus. - strings
- Music, B.Mus. - vocal: K-12 certification
- Music, B.Mus. - voice
- Music, B.Mus. - wind or percussion instrument
- Music, B.Mus.-composition
- Performing Arts, B.A.
- Philosophy, B.A.
- Physics, B.S.
- Political Science, B.A.
- Psychology, B.A.
- Psychology, B.S.
- Public Relations, B.S.
- Religious Studies, B.A.
- Sociology, B.A., B.S.
- Software Engineering, B.S.
- Speech Communication, B.A.
- Statistics, B.S.
- Technical Communication, B.S.
- Theatre, B.A. - See Performing Arts
- Women's and Gender Studies, B.A., B.S.
- World Languages and Cultures B.A-French/German/Spanish

# UNDERGRADUATE MAJORS, CERTIFICATES, MINORS, PRE-PROFESSIONAL STUDY

## ACADEMIC PROGRAM DEFINITIONS

- **Program** - administrative infrastructure supporting the curriculum.
- **Curriculum** - the requirements for a major, certificate, or minor.
- **Major** - subject area of study that results in a named baccalaureate, masters, or doctoral degree upon completion of a set of requirements. A major appears on the academic transcript.
- **Secondary major** - a major that can only be earned concurrent with a primary major. A secondary major appears on the academic transcript.
- **Option** - credits within an undergraduate major in which students choose coursework focused on a subset of the subject area of study. The remainder of the degree requirements are common to all students in the major. Options have also been called specializations, tracks, emphasis areas, focus areas, etc. An option does not appear on the academic transcript.
- **Certificate** - an academic credential in a focused area of study. A certificate appears on the academic transcript and may be earned concurrent with a degree or on its own.
- **Minor** - an academic area of emphasis that is in addition to a major. A minor appears on the academic transcript and must be earned concurrent with a degree.

## UNIVERSITY REQUIREMENTS

### Undergraduate Degree Requirements

Iowa State University offers a wide variety of undergraduate majors housed in six colleges. The requirements for all majors include the following university-wide requirements for graduation:

- Communication Proficiency
- U.S. Diversity
- International Perspectives
- LIB 160 Introduction to College Level Research
- Minimum of 120-semester credits
- Cumulative grade point average of at least 2.00 in all coursework taken at ISU

See Degree Planning for university-wide requirements for the bachelor's degree.

## COLLEGES

- College of Agriculture and Life Sciences
- Ivy College of Business

- College of Design
- College of Engineering
- College of Human Sciences
- College of Liberal Arts and Sciences

The College of Veterinary Medicine offers the Doctor of Veterinary Medicine degree.

For a listing of the majors offered by the Graduate College, see the Graduate Programs list in this catalog.

## UNDERGRADUATE MAJORS

See Degree Planning for university-wide requirements for the bachelor's degree.

**Major** - subject area of study that results in a named baccalaureate, masters, or doctoral degree upon completion of a set of requirements. A major appears on the academic transcript.

**Secondary major** - a major that can only be earned in conjunction with a primary major. A secondary major appears on the academic transcript.

**Option** - credits within an undergraduate major in which students choose coursework focused on a subset of the subject area of study. The remainder of the degree requirements are common to all students in the major. Options have also been called specializations, tracks, emphasis areas, focus areas, etc. An option does not appear on the academic transcript.

- Accounting, B.S.
- Actuarial Science, B.S.
- Advertising, B.A.
- Aerospace Engineering, B.S.
- Agricultural and Life Sciences Education, B.S.
- Agricultural and Rural Policy Studies, B.S.
- Agricultural Business, B.S.
- Agricultural Engineering, B.S.
- Agricultural Studies, B.S.
- Agricultural Systems Technology, B.S.
- Agronomy, B.S.
- Animal Ecology, B.S.
- Animal Science, B.S.
- Anthropology, B.A., B.S.
- Apparel, Merchandising and Design, B.S.
- Architecture, B.Arch.
- Art and Design, B.A.
- Athletic Training
- Biochemistry, B.S. (College of Agriculture and Life Sciences)



- Biochemistry, B.S. (College of Liberal Arts and Sciences)
- Bioinformatics and Computational Biology, B.S.
- Biological Systems Engineering, B.S.
- Biological/Pre-Medical Illustration, B.A.
- Biology, B.S. (College of Agriculture and Life Sciences)
- Biology, B.S. (College of Liberal Arts and Sciences)
- Biophysics, B.S.
- Business Administration, B.B.A.
- Business Analytics, B.S.
- Business Economics, B.S.
- Chemical Engineering, B.S.
- Chemistry, B.A., B.S.
- Civil Engineering, B.S.
- Classical Studies - *See Interdisciplinary Studies, B.A., B.S.*
- Climate Science, B.S.
- Communication Studies, B.A.
- Community and Regional Planning, B.S.
- Computer Engineering, B.S.
- Computer Science, B.A., B.S.
- Construction Engineering, B.S.
- Criminal Justice, B.A.
- Culinary Food Science, B.S. (College of Agriculture and Life Sciences)
- Culinary Food Science, B.S. (College of Human Sciences)
- Cyber Security Engineering, B.S.
- Dairy Science, B.S.
- Data Science, B.S.
- Diet and Exercise, B.S./M.S. (College of Agriculture and Life Sciences)
- Diet and Exercise, B.S./M.S. (College of Human Sciences)
- Dietetics, B.S. (College of Agriculture and Life Sciences)
- Dietetics, B.S. (College of Human Sciences)
- Early Childcare Education and Programming, B.S.
- Early Childhood Education, B.S.
- Earth Science, B.A., B.S.
- Economics, B.S.
- Education Secondary - *See Undergraduate Secondary Majors*
- Electrical Engineering, B.S.
- Elementary Education, B.S.
- English, B.A., B.S.
- Entrepreneurship, B.S.
- Environmental Engineering, B.S.
- Environmental Science, B.S. (College of Agriculture and Life Sciences)
- Environmental Science, B.S. (College of Liberal Arts and Sciences)
- Environmental Studies - *See Undergraduate Secondary Majors*
- Event Management, B.S.
- Family and Consumer Sciences Education and Studies, B.S.
- Finance, B.S.
- Financial Counseling and Planning, B.S.
- Food Science, B.S. (College of Agriculture and Life Sciences)
- Food Science, B.S. (College of Human Sciences)
- Forestry, B.S.
- French - *See World Languages and Cultures, B.A.*
- Genetics, B.S. (College of Agriculture and Life Sciences)
- Genetics, B.S. (College of Liberal Arts and Sciences)
- Geology, B.S.
- German - *See World Languages and Cultures, B.A.*
- Global Resource Systems, B.S.
- Graphic Design, B.F.A.
- Healthcare Management, B.S.
- History, B.A., B.S.
- Horticulture, B.S.
- Hospitality Management, B.S.
- Human Development and Family Studies, B.S.
- Human Resource Management, B.S.
- Industrial Design, B.I.D.
- Industrial Engineering, B.S.
- Industrial Technology, B.S.
- Integrated Studio Arts. B.F.A.
- Interdisciplinary Design - *See Undergraduate Secondary Majors*
- Interdisciplinary Studies, B.A., B.S.
  - Classical Studies
  - U.S. Latino/a Studies
- Interior Design, B.F.A.
- International Agriculture - *See Undergraduate Secondary Majors*
- International Business - *See Undergraduate Secondary Majors*
- International Studies - *See Undergraduate Secondary Majors*
- Journalism and Mass Communication, B.S.
- Kinesiology and Health, B.S.
- Landscape Architecture, B.L.A.
- Liberal Studies, B.L.S. (a general studies degree)
- Linguistics, B.A.
- Management, B.S.
- Management Information Systems, B.S.
- Marketing, B.S.
- Materials Engineering, B.S.

- Mathematics, B.S.
- Mechanical Engineering, B.S.
- Meteorology, B.S.
- Microbiology, B.S.
- Music, B.A., B.Mus.
- Nursing, B.S.N. (College of Agriculture and Life Sciences)
- Nursing, B.S.N. (College of Human Sciences)
- Nutritional Science, B.S. (College of Agriculture and Life Sciences)
- Nutritional Science, B.S. (College of Human Sciences)
- Performing Arts, B.A.
- Philosophy, B.A.
- Physics, B.S.
- Political Science, B.A.
- Professional Studies, B.L.S. (a general studies degree)
- Psychology, B.A., B.S.
- Public Relations, B.S.
- Religious Studies, B.A.
- Seed Science - *See Undergraduate Secondary Majors*
- Sociology, B.A., B.S.
- Software Engineering, B.S. (College of Engineering)
- Software Engineering, B.S. (College of Liberal Arts and Sciences)
- Spanish - *See World Languages and Cultures, B.A.*
- Speech Communication, B.A.
- Statistics, B.S.
- Supply Chain Management, B.S.
- Technical Communication, B.S.
- Theatre - *See Performing Arts, B.A.*
- U.S. Latino/a Studies - *See Interdisciplinary Studies, B.A., B.S.*
- Women's and Gender Studies, B.A., B.S.
- World Languages and Cultures B.A.
  - French
  - German
  - Spanish

## Undergraduate Secondary Majors

See Degree Planning for university-wide requirements for the bachelor's degree.

**Secondary major** - a major that can only be earned in conjunction with a primary major. A secondary major appears on the academic transcript.

- Education Secondary
- Environmental Studies
- Interdisciplinary Design

- International Agriculture
- International Business
- International Studies
- Seed Science

## UNDERGRADUATE CERTIFICATES

See Degree Planning for university-wide requirements for an undergraduate certificate.

**Certificate** - an academic credential in a focused area of study. A certificate appears on the academic transcript and may be earned concurrently with a degree or on its own.

- Actuarial Science
- Beef Cattle Production Management
- Computing Applications
- Dairy Cattle Production Management
- Data Science
- Equine Science and Management
- Health Coach
- Integrated Studio Arts
- Latin American Studies
- Leadership Studies
- Merchandising (^)
- Occupational Safety
- Poultry Production Management
- Professional Sales
- Science Communication
- Soil Science (^)
- Swine Production Management

Certificates may be earned at the same time as an ISU baccalaureate degree or after the completion of a baccalaureate degree from any accredited institution. Those marked with a (^) may also be earned after the completion of an associate of arts (AA) or associate of science (AS) degree from any accredited institution.

Iowa State University also offers certificates from the Graduate College.

## UNDERGRADUATE MINORS

See Degree Planning for university-wide requirements for an undergraduate minor.

**Minor** - an academic area of emphasis that is in addition to a major. A minor appears on the academic transcript and must be earned in conjunction with a degree.

- Accounting
- Advertising
- African and African American Studies
- Agricultural Business
- Agricultural Systems Technology
- Agriculture and Life Sciences Education
- Agronomy
- American Indian Studies
- Animal Ecology
- Animal Science
- Anthropology
- Apparel, Merchandising, and Design
- Astronomy
- Beverage Management
- Biochemistry
- Bioinformatics and Computational Biology
- Biological/Pre-Medical Illustration
- Biology
- Biomedical Engineering
- Business Analytics
- Business and Technology Consulting
- Chemistry
- Chinese Studies
- Classical Studies
- Communication Studies
- Computer Science
- Criminal Justice
- Critical Studies in Design
- Culinary Food Science
- Cyber-Physical Systems
- Cyber Security
- Dance
- Data Science
- Design Studies
- Digital Media
- Economics
- Education Services in Family and Consumer Sciences
- Energy Systems Engineering
- Engineering Sales
- English
- Entrepreneurship
- Environmental Studies
- Ethics
- Event Management
- Exercise Science
- Fashion Culture History and Social Justice
- Feed Technology
- Finance
- Financial Counseling and Planning
- Food and Society
- Food Safety
- Food Science
- Forestry
- French
- General Business
- Genetics (AGLS)
- Genetics (LAS)
- Geographic Information Science (GIS)
- Geology
- German
- Gerontology
- Global Health
- Global Human Sciences
- Health Promotion
- History
- Horticulture
- Hospitality Management
- Human Development and Family Studies
- Illustration
- Industrial Technology
- Insect Science
- International Agriculture
- International Business
- International Studies
- Journalism and Mass Communication
- Kinesiology
- Leadership Studies
- Learning and Leadership Sciences
- Learning Technologies
- Landscape Management
- Linguistics
- Management
- Management Information Systems
- Marketing

- Mathematics
- Meat Science
- Meteorology
- Microbiology
- Middle Eastern Studies
- Military Studies
- Music
- Music Technology
- Nondestructive Evaluation
- Nutrition
- Performing Arts (Theatre)
- Pharmacology and Toxicology
- Philosophy
- Physics
- Political Science
- Preservation and Cultural Heritage
- Psychology
- Public Relations
- Religious Studies
- Russian Studies
- Sociology
- Spanish
- Spanish Translation and Interpretation Studies
- Speech Communication
- Statistics
- Supply Chain Management
- Sustainability
- Teaching English as a Second Language
- Technical Communication
- Textile Design
- Textile Science and Product Performance
- Theatre - See Performing Arts
- U.S. Latino/a Studies
- Urban Studies
- Women's and Gender Studies
- World Film Studies

## PRE-PROFESSIONAL STUDY

Requirements for admission to most professional academic programs can be met by study at Iowa State University. Pre-professional programs such as pre-law or pre-med are not degree-granting majors, but rather tracks for students who plan to attend professional school (e.g., dental, medical, optometry, physical therapy, law, or veterinary medicine) after

their undergraduate studies. Students can major in any field, and they will work with an advisor who helps with course sequencing and academic preparation for application to professional schools.

For more details, explore the Pre-professional section of the catalog and explore the links below.

### Tracks

- Pre-Health & Pre-Medicine (<https://pre-health.las.iastate.edu/>)
  - Dentistry (<https://pre-health.las.iastate.edu/health-professions/dentistry/>)
  - Human Medicine (<https://pre-health.las.iastate.edu/health-professions/human-medicine/>)
  - Optometry (<https://pre-health.las.iastate.edu/health-professions/optometry/>)
  - Pharmacy (<https://pre-health.las.iastate.edu/health-professions/pharmacy/>)
  - Physical Therapy (<https://pre-health.las.iastate.edu/health-professions/physical-therapy/>)
  - Physician's Assistant (<https://pre-health.las.iastate.edu/health-professions/physicians-assistant/>)
- Pre-Law
- Pre-Veterinary Medicine

## Pre-professional Study

### Pre-professional Study

Iowa State University is a great place to prepare for careers that require professional school training, such as medical school, law school or veterinary school. Requirements for admission to most professional academic programs can be met during your studies at Iowa State University. The specific courses taken in a pre-professional program will depend primarily upon the admission requirements of the professional schools to which a student wants to apply.

In some programs where professional schools require only three years of pre-professional work, a student may, by careful planning, complete requirements for the bachelor's degree upon transferring to Iowa State up to 32 semester credits of professional coursework. Generally these reverse transfer credits will be counted as electives, but a maximum of 24 may be used to apply to a major in Interdisciplinary Studies and a smaller number may be used to meet requirements in other majors as approved by the faculty.

All students, whether they have selected a major or not, are encouraged to identify their interest in a professional career by designating it on their application to the university. Students who have not decided on a major can enter Iowa State as pre-professional students, selecting pre-medical, pre-law, pre-professional health (PHP), Open Option, or General

Undergraduate Studies Pre-Veterinary Medicine (GENPV), until they choose a major or transfer to a professional school.

Information about pre-professional program admissions requirements and career opportunities in human health or law is available in the Liberal Arts and Sciences Advising Center. Information about veterinary medicine admissions requirements and career opportunities is available from the coordinator of the pre-veterinary program in the Office of the Dean of the College of Veterinary Medicine.

## Learn More About These and Other Pre-Professional Pathways

- Pre-Health & Pre-Medicine (<https://pre-health.las.iastate.edu/>)
  - Dentistry (<https://pre-health.las.iastate.edu/health-professions/dentistry/>)
  - Human Medicine (<https://pre-health.las.iastate.edu/health-professions/human-medicine/>)
  - Optometry (<https://pre-health.las.iastate.edu/health-professions/optometry/>)
  - Pharmacy (<https://pre-health.las.iastate.edu/health-professions/pharmacy/>)
  - Physical Therapy (<https://pre-health.las.iastate.edu/health-professions/physical-therapy/>)
  - Physician's Assistant (<https://pre-health.las.iastate.edu/health-professions/physicians-assistant/>)
- Pre-Law
- Pre-Veterinary Medicine

## Pre-Health & pre-medical Advising

Iowa State University is a great place to prepare for careers in health and medicine. As a major research university with an exceptional student experience, we're excited to help you create a competitive application for medical or professional school. Whether you are aiming for a career in human medicine, dentistry, occupational health, physical therapy, pharmacy, optometry, health information management, dietetics, hospital and health administration, medical technology, clinical lab sciences, or many others, you can find the classes and experiences you need to be prepared for the next steps in your professional training. Learn more on the Pre-health and Pre-medical Professions Advising (<https://pre-health.las.iastate.edu/>) website.

## PRE-Law Preparation

A student planning to enter law school may pursue an undergraduate degree in any discipline. The choice of the bachelor's degree should reflect a student's passion and personal interests rather than be limited by a belief that law schools require a specific major. Students should complete courses that will enhance their strengths in critical thinking, analytical writing, research and oral communication. Courses from a

broad range of disciplines will provide students with the knowledge base and skills to support their preparation for law school. Courses might include accounting, criminal justice, economics, English literature, history, management, mathematics, political science, psychology, philosophy and statistics. Advanced writing courses and speech communication courses will also serve students well. The American Bar Association ([https://www.americanbar.org/groups/legal\\_education/resources/pre\\_law/](https://www.americanbar.org/groups/legal_education/resources/pre_law/)) advises students that "taking a broad range of difficult courses from demanding instructors is excellent preparation for legal education." The College of Liberal Arts and Sciences participates in a 3+3 program with the Law Schools at Drake University and at the University of Iowa. Visit the Liberal Arts and Sciences Student Academic Services office for details about the 3+3 program and pre-law club, and to explore your pathway to law school.

Learn more on the Pre-Law Advising (<https://pre-law.las.iastate.edu/>) website.

## Pre-Veterinary Medicine

Deanna Gerber ([futuredvm@iastate.edu](mailto:futuredvm@iastate.edu))

About 75% of all veterinarians are engaged in private practice. In a mixed practice, they diagnose and treat health problems among a variety of animals. Others specialize in one species (e.g., feline, pet bird) and still others specialize in a specific discipline within veterinary medicine (e.g., cardiology, ophthalmology). Veterinarians may also choose public and corporate practice (e.g., public health, education, research, food safety, industry, laboratory animal medicine, aquatic animal medicine, poultry medicine, and military veterinary medicine).

The professional program requires four years at a college of veterinary medicine and leads to the doctor of veterinary medicine degree (D.V.M.). Admission to a veterinary college involves at least two years of preprofessional college education. Candidates must take courses in biology, chemistry, genetics, physics, English, humanities, social sciences, speech, anatomy and physiology, and biochemistry. (For Iowa State University see Pre-Veterinary Medicine Preparation in the Veterinary Medicine section of the catalog; for the most current information regarding applications and admission to the College of Veterinary Medicine, please refer to the College website at [www.vetmed.iastate.edu/](http://www.vetmed.iastate.edu/) (<http://www.vetmed.iastate.edu/>).)

Students may pursue their pre-veterinary preparation in any college at Iowa State University. A major (pre-veterinary medicine is not a major) should be selected that is allied to each student's vocational interests in veterinary medicine or that otherwise offers vocational satisfaction in the event that plans for entry into the College of Veterinary Medicine change. Students are encouraged to pursue a bachelor's degree; the most effective progress toward a bachelor's degree is made when a major is selected upon entry and no change occurs before graduation. However,

students who have not even considered a career other than veterinary medicine may need some time to explore possibilities before selection of a major.

To assist students who have indicated interest in the pre-veterinary program for the College of Veterinary Medicine and are undecided about a major, an advising category is available known as GENPV (General Undergraduate Studies Pre Vet). Orientation and advising services for these students are designed to help students fulfill pre-veterinary course requirements, to introduce available majors and careers allied to veterinary medicine, and to introduce career options in veterinary medicine. GENPV students must select a major by the end of their second semester. Some Iowa State University majors allow, by careful planning, the opportunity for a student to earn the bachelor's degree by combining credits from three years of preprofessional study and one year of professional study in the College of Veterinary Medicine.



# COLLEGE OF AGRICULTURE AND LIFE SCIENCES

Daniel Robison, Endowed Dean  
David Acker, Associate Dean, Global Engagements  
Carmen Bain, Associate Dean, Academic Innovation  
Theressa Cooper, Assistant Dean, Diversity  
Jay Harmon, Associate Dean, Extension Programs and Outreach  
Carolyn Lawrence-Dill, Associate Dean, Research and Discovery  
Ruth MacDonald, Associate Dean, Personnel and Finance  
Howard Tyler, Assistant Dean, Undergraduate and Graduate Student Services and Success

[www.cals.iastate.edu](http://www.cals.iastate.edu) (<http://www.cals.iastate.edu>)

Students enrolled in the College of Agriculture and Life Sciences receive a broad-based education that includes: communications, biological, physical, and social sciences, humanities, and technical subject matter.

Graduates of the College are prepared for diverse career opportunities because of the well-balanced education they have received. Opportunities for graduates of the College of Agriculture and Life Sciences include: agribusiness and industry, production agriculture, biological and environmental sciences, value-added processing, natural resource management, rural development, public agencies, education, animal and human health professions, graduate studies and professional schools.

## Advising

Each student in the College of Agriculture and Life Sciences works closely with an academic advisor who is associated with the major in which the student is enrolled.

The advisors assist students in making personal adjustments to university life, offer suggestions on academic and co-curricular choices, and provide information on career choices. Advisors make a special effort to adjust course schedules in accordance with students' interests and capabilities.

All entering students are strongly encouraged to participate in the summer orientation program in which they will have the opportunity to meet and work with academic advisors in planning their first semester schedule of classes.

A student may wish to prepare for admission to a professional program such as law, medicine, or veterinary medicine while pursuing a bachelor of science degree in the College of Agriculture and Life Sciences. This may be accomplished through several majors; however, it is recommended that the student work closely with an academic advisor.

## Degree Requirements for all CALS Majors

All undergraduate majors in the College of Agriculture and Life Sciences (CALS) lead to a bachelor of science degree.

### High School Preparation

Requirements for students entering from high school or transferring with less than 24 college credits into the College of Agriculture and Life Sciences include four years of English; three years of mathematics which must include one year each of algebra, geometry, and advanced algebra; three years of science which must include one year each of Biology and chemistry, or Biology and physics, or chemistry and physics; and two years of social studies. No foreign language is required for admission to the College of Agriculture and Life Sciences.

### College Requirements

To graduate with a degree from the College of Agriculture and Life Sciences a student must complete, while at Iowa State University, a minimum of 18 credits from the College's departmental offerings, program offerings, and cross-listed program offerings. Twelve or more of those 18 credits must be 300-level or above. Some majors within the College may have more restrictive requirements.

Each major has specific degree requirements for graduation based on the major and college student learning outcomes. College of Agriculture and Life Sciences course requirements for the four areas listed below provide the foundation for successful achievement of both major and college student learning outcomes.

The College of Agriculture and Life Sciences course requirements for all majors are:

Interpersonal and public communication skills	10 credits
6 credits of English composition with grades of C or better	
3 credits of speech fundamentals with grades of C or better	
1 credit of LIB 160 Introduction to College Level Research	
Mathematical, physical, and life sciences from college-approved lists	17 credits
3 credits of mathematics	
3 credits of statistics	
5 credits of physical science (e.g., chemistry, geological and atmospheric sciences, physics)	
6 credits of life sciences including BIOL 101 Introductory Biology, or BIOL 211 Principles of Biology I, or BIOL 212 Principles of Biology II, or BIOL 251 Biological Processes in the Environment and 3 additional credits of life sciences	

Personal development from approved lists 15 credits

3 credits of ethics (college list)

3 credits of humanities (college list)

3 credits of social sciences (college list)

3 credits of U.S. diversity (university list)

3 credits of international perspectives (university list)

Students pursuing a primary major in another college and taking a second major in the College of Agriculture and Life Sciences must fulfill the core course requirements of the College of Agriculture and Life Sciences, and all the requirements of the second major.

## Student Learning Outcomes

All students graduating with majors within the College of Agriculture and Life Sciences are expected to be able to do the following (college-level outcomes) at the time of graduation:

### Communications

- Speak and write clearly and persuasively.
- Prepare effective visual and electronic forms of communication.

### Problem-Solving/Critical Thinking

- Apply a holistic approach to identify and solve complex problems.
- Distinguish verifiable facts from value claims.
- Identify assumptions and detect bias.
- Distinguish relevant from irrelevant information.
- Establish priorities and courses of action.
- Summarize, analyze, and interpret research data and/or policy issues.

### Leadership and Teamwork

- Organize, facilitate, and participate effectively in a group or team.
- Define a problem or opportunity, and implement an action planning process.
- Work towards a goal and justify actions taken.

### Creativity, Innovation and Entrepreneurship

- Demonstrate innovativeness and creativity.
- Identify and pursue opportunities that produce value.
- Identify resources to manage risk to facilitate change

### Ethics

- Define and assess their ethical perspective, moral responsibility, and values.
- Identify and critically evaluate contemporary ethical and moral issues in professional and private life.

### Environmental Awareness

- Explain physical interactions within ecosystems.
- Explain biological interactions within ecosystems.

- Explain how human activities impact the environment.
- Explain how societies are affected by environmental change.

## Diversity and Global Citizenship (University Outcomes)

- Through completion of the U.S. Diversity requirement, should achieve at least three of the following learning outcomes:
  - Identify the experiences and contributions of underrepresented or marginalized groups and how they have shaped the history and culture of the United States;
  - Understand the analytical concepts of culture, ethnicity, race, gender, sexuality and/or religion and be able to apply these concepts to an analysis of the United States;
  - Analyze systemic oppression and personal prejudice and their impact on marginalized communities and the broad U.S. society; and
  - Evaluate important aspects of diversity, equity and inclusion so they can live, work and collaborate with others in the 21st century United States.
- Through completion of the International Perspectives requirements, students should achieve two of the following learning outcomes:
  - Analyze the accuracy and relevancy of their own worldviews and anticipate how people from other nations may perceive that worldview;
  - Describe and analyze how cultures and societies around the world are formed, are sustained, and evolve;
  - Analyze and evaluate the influence of global issues in their own lives;
  - Describe the values and perspectives of cultures other than their own and discuss how they influence individuals' perceptions of global issues and/or events; and
  - Communicate competently in a second language.

## Information Literacy

- Demonstrate proficient acquisition and use of information relevant to their fields of study.

In addition to the College level learning outcomes, each major within the college has additional discipline-specific outcomes that apply to graduates of that major.

## Electives

Students use electives in addition to degree requirements to broaden their education or to strengthen an area of specialization. Electives may be used to meet the requirements for multiple majors (see statement on multiple majors in this catalog).

## Other Requirements

- Those who wish to change their major, or who decide to graduate with multiple majors, must be enrolled for the last two semesters in the major in which they expect to graduate.
- Students in ROTC may apply ROTC credits toward elective requirements. No more than 9 credits of 490 coursework from any Iowa State University major may be applied toward graduation, although some individual majors may establish a more restrictive use of 490 credits toward fulfillment of graduation requirements.

## Graduate Study

Graduate study in agriculture and life sciences is conducted through the Graduate College. Details are found in the Graduate College section of this catalog.

Various departments in the College of Agriculture and Life Sciences also participate in the following graduate-level interdepartmental offerings:

- Ecology and Evolutionary Biology
- Environmental Science
- Genetics and Genomics
- Immunobiology
- Microbiology
- Molecular, Cellular, and Developmental Biology
- Neuroscience
- Nutritional Sciences
- Plant Biology
- Seed Technology and Business
- Sustainable Agriculture
- Technology and Social Change (interdepartmental minor)
- Toxicology

## Departments in the College

Departments are the administrative units that offer undergraduate and graduate majors, minors and certificates in addition to their efforts in research, outreach and service. These are the departments in the College of Agriculture and Life Sciences:

- Agricultural and Biosystems Engineering (joint with the College of Engineering)
- Agricultural Education and Studies
- Agronomy
- Animal Science
- Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology (joint with the College of Liberal Arts and Sciences)
- Ecology, Evolution, and Organismal Biology (joint with the College of Liberal Arts and Sciences)

- Economics (joint with the College of Liberal Arts and Sciences)
- Food Science and Human Nutrition (joint with the College of Human Sciences)
- Genetics, Development and Cell Biology (joint with the College of Liberal Arts and Sciences)
- Horticulture
- Natural Resource Ecology and Management
- Plant Pathology, Entomology and Microbiology
- Sociology and Criminal Justice (joint with the College of Liberal Arts and Sciences)
- Statistics (joint with the College of Liberal Arts and Sciences)

## Undergraduate Majors, Minors and Certificates

An undergraduate major is a subject area of study that results in a named baccalaureate degree upon completion of a set of requirements. All majors in the College of Agriculture and Life Sciences result in a Bachelor of Science degree.

A student has many majors from which to choose. Each major is unique although some courses are common across majors in the first two years. This is helpful to students in that they may transfer from one major to another before the second year with little loss of credits.

Options within a major further define some majors and specify certain required coursework. All majors are designed to help students achieve the learning outcomes and succeed in their chosen professions.

## Primary Majors

Agricultural Business

Agricultural and Life Sciences Education

Agricultural and Rural Policy Studies

Agricultural Studies

Agricultural Systems Technology

Agronomy

Animal Ecology

Animal Science

Biochemistry

Biology

Culinary Food Science

Dairy Science

Diet and Exercise

Dietetics

Environmental Science

Food Science

Forestry

Genetics

Global Resource Systems

Horticulture  
Industrial Technology  
Microbiology  
Nursing  
Nutritional Science

## Secondary Majors\*

Environmental Studies  
International Agriculture  
Seed Science

\*A secondary major must be taken in conjunction with a primary major.

## Minors

An undergraduate minor is an academic area of emphasis in addition to a major consisting of at least 15 credits. It must be earned concurrent with a major.

Agricultural Business  
Agricultural and Life Sciences Education  
Agricultural Systems Technology  
Agronomy  
Animal Ecology  
Animal Science  
Biochemistry  
Biology  
Culinary Food Science  
Entrepreneurial Studies\*  
Environmental Studies  
Feed Technology\*  
Food and Society  
Food Safety\*  
Food Science  
Forestry  
Genetics  
Global Health\*  
Horticulture  
Industrial Technology  
Insect Science  
International Agriculture  
Landscape Management  
Learning and Leadership Sciences\*  
Meat Science  
Microbiology  
Nutrition  
Sustainability\*

\*The College of Agriculture and Life Sciences participates in these interdepartmental minors.

## Certificates

An undergraduate certificate is an academic credential in a focused area of study consisting of at least 20 credits. It may be earned concurrent with a major or on its own.

Beef Cattle Production Management  
Dairy Cattle Production Management  
Equine Science and Management  
Poultry Production Management  
Swine Production Management  
Occupational Safety

## Special Programs

### Agriculture Exploration

Agriculture Exploration is a starting place for students who wish to pursue careers in the life sciences, food science, natural resources, production agriculture, business, or communications but who are unsure of which majors to choose. Students entering this program will be advised in the College of Agriculture and Life Sciences Student Services Office until they select their majors.

### Preveterinary Medicine

Students in the College of Agriculture and Life Sciences may complete the requirements for admission to the College of Veterinary Medicine by enrolling in any major within the college. Because a solid foundation in the sciences is basic to the program in veterinary medicine, those majors that emphasize the sciences are usually more compatible with veterinary medicine.

New students direct from high school who are undecided about choice of major may enroll as a general preveterinary studies (Gen PV) student. These students will also enroll in an orientation course, which describes the various college majors. By the end of their first semester, a Gen PV student must select a major. Transfer students, however, must select a major prior to enrolling in their first semester classes.

Enrollment as a Gen PV student does not guarantee admission into the College of Veterinary Medicine (veterinary school). See the College of Veterinary Medicine section of this catalog for specific admissions requirements.

Students accepted into the College of Veterinary Medicine without a bachelor of science degree have an opportunity, with careful planning, to complete the requirements for a bachelor of science degree in an individual curriculum within the College of Agriculture and Life Sciences after admission into the College of Veterinary Medicine. This may be done by completing the prescribed course of study established by an individual major. Students also may meet degree requirements of an individual major through the College of Agriculture and Life Sciences Honors Program. Further details are available from an academic advisor

or from members of the College of Agriculture and Life Sciences Honors Committee.

## Honors Program

The College of Agriculture and Life Sciences Honors Program provides an opportunity for students of high ability to maximize their educational experience by individualizing their program of study. (See statement on Honors Program in the Colleges and Curricula section of this catalog). For more information, contact the chair of the College of Agriculture and Life Sciences Honors Committee, or a department Honors contact person.

## Off-Campus Programs

Online courses, certificates, and graduate programs (<https://www.agonline.iastate.edu>) from the College of Agriculture and Life Sciences are designed for working professionals and recent graduates alike giving students anywhere in the world the opportunity to enhance their careers and advancing in their profession. Students learn from the same faculty and in the same classes as our resident students. Start your adventure with one of our online certificates or programs to advance your career.

Master's Programs: Agricultural Education, Agronomy, Plant Breeding, Seed Technology and Business

Graduate Certificates: Agronomy, Biochemistry, Food Safety and Defense, Meat Science, Seed Science and Technology, Seed Business Management

Undergraduate BS: Agricultural Studies Hybrid Online/Campus

Undergraduate Certificates: Swine Science, Occupational Safety

## Study Abroad and International Travel Opportunities

Agriculture and life sciences are part of a highly interconnected global system; decisions made in one sector have profound impacts worldwide. It is important for students to develop an understanding and appreciation for the global system and the role that U.S. agriculture plays in providing a safe and predictable food supply for a growing world population. The College of Agriculture and Life Sciences provides study abroad and international internship opportunities on all seven continents. Students can enroll in CALS travel courses, spend a semester or more at a partner university abroad or develop an independent academic opportunity like research, service learning or working abroad. Travel ranges from two weeks to a year and students travel to over 30 countries annually. For additional information, contact the Office of Global Programs in the College of Agriculture and Life Sciences (<https://www.agstudyabroad.iastate.edu>).

## Internships and Cooperative Education Programs

Practical work experience can provide a unique learning opportunity that complements academic coursework. This experience is provided

through internships or cooperative education programs. For additional information, contact a departmental advisor or internship coordinator.

# Agricultural and Life Sciences Education

## OVERVIEW

Administered by the Department of Agricultural Education and Studies

For undergraduate curricula in agricultural and life sciences education, and agricultural studies, leading to the degree of bachelor of science, see College of Agriculture and Life Sciences, Curricula.

The department offers two curricula for students desiring to enter careers in agriculture and related fields. These curricula are agricultural and life sciences education and agricultural studies. The agricultural and life sciences education curriculum prepares persons for careers as agricultural education instructors, and educational specialists for industry, nonprofit organizations, and governmental agencies. The agricultural studies curriculum has two options, production and management and multidisciplinary. Graduates are prepared for careers in production agriculture and agricultural industry. Graduates of both curricula accept positions in agricultural business, industry, agencies, and production agriculture.

## Student Learning Outcomes

Graduates will have a broad base of agricultural knowledge, and will be skilled in decision-making, planning, organizing, presenting, and evaluating information. Through the successful completion of the required coursework, active participation in clubs and organizations, and the acquisition of technical skills and experiences associated with work experiences, internships, and international travel, graduates of our baccalaureate programs meet the university, college, and departmental outcomes in the following nine areas:

1. professional, interpersonal, and cross-cultural communications
2. problem solving and critical thinking
3. leadership
4. entrepreneurship
5. life-long learning
6. ethics
7. environmental awareness
8. U.S. diversity
9. international perspectives.

More information regarding the departmental learning outcomes can be found at [www.ageds.iastate.edu/](http://www.ageds.iastate.edu/). (<http://www.ageds.iastate.edu/>)

## Curriculum in Agricultural and Life Sciences Education

Administered by the Department of Agricultural Education and Studies. Students majoring in Agricultural and Life Sciences Education may lead to teacher licensure.

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA. Teacher certification requires 2.5 GPA at particular points in the program of study, and a minimum grade of C- in selected courses.

#### University Requirements:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
International Perspectives		3
LIB 160	Introduction to College Level Research	1
US Diversity		3
<b>Total Credits</b>		<b>13</b>

#### CALS Requirements: Communications Proficiency:

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	3
American History Elective		3
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
ECON 101	Principles of Microeconomics	3
Ethics Elective from Approved List		3
MATH 140	College Algebra	3
STAT 104	Introduction to Statistics	3

#### Major Specific Requirements - Agricultural Sciences and Economics (C- or higher required)

ACCT 284	Financial Accounting	3
Ag Elective From Approved List		3
AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
AGEDS 488	Methods of Teaching Agricultural Mechanics	3
AGRON 181	Introduction to Crop Science	3

AGRON 182	Introduction to Soil Science	3
AN S 101	Working with Animals	2
AN S 114	Survey of the Animal Industry	2
HORT 221	Principles of Horticulture Science	3
ECON 230	Farm Business Management	3
NREM 120	Introduction to Renewable Resources	3
AGEDS 388	Agricultural Mechanics Applications	3
<b>Total Credits</b>		<b>34</b>

#### Major Specific Requirements - Professional Credits (C or higher required):

AGEDS 110	Professional Development in Agricultural Education and Studies: New Student Seminar	1
AGEDS 211A	High School Agriculture Programs	1
AGEDS 310	Foundations of Agricultural Education Programs	3
AGEDS 401	Planning Agriculture and Life Sciences Education Programs	3
AGEDS 402	Methods of Teaching in Agriculture and Life Sciences	3
AGEDS 416	Pre-Student Teaching Experience in Agricultural Education	1
AGEDS 417	Supervised Teaching in Agriculture and Life Sciences	1-16
EDUC 333	Educational Psychology	3
PSYCH 230	Developmental Psychology	3
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3
<b>Total Credits</b>		<b>22-37</b>

**Electives:** Select courses to get to 128 credits.

## Agricultural and Life Sciences Education, B.S.

#### Freshman

Fall	Credits Spring	Credits
AGEDS 110	1 ENGL 250	3
AN S 114	2 ECON 101	3
AN S 101	2 AGRON 181	3
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
ENGL 150	3 Choose from Approved Ag Elective List	3
LIB 160	1	
MATH 140	3	
<b>16</b>		<b>16</b>



**Sophomore**

Fall	Credits Spring	Credits
CHEM 163	4 PSYCH 230	3
CHEM 163L	1 Ethics Elective	3
NREM 120	3 STAT 104	3
ACCT 284	3 American History Elective	3
AGEDS 310	3 AGEDS 211	1
AGEDS 388	3 HORT 221	3
	<b>17</b>	<b>16</b>

**Junior**

Fall	Credits Spring	Credits
ECON 230	3 Intl Perspectives Elective	3
AGEDS 315	3 AGEDS 401	3
EDUC 333	3 Elective	6
AGEDS 488	3 AGRON 182	3
Elective	3	
	<b>15</b>	<b>15</b>

**Senior**

Fall	Credits Spring	Credits
AGEDS 311	3 AGEDS 416	1
AGEDS 402	3 AGEDS 417	1-16
Elective	6	
SP ED 401	3	
US Diversity	3	
	<b>18</b>	<b>2-17</b>

**Minor - Agricultural and Life Sciences Education**

The department offers a minor in agricultural and life sciences education which may be earned by completion of a minimum of 15 credits in agricultural education and studies courses, with a minimum of two courses at the 400 level. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. A minor will not meet state licensure requirements for teaching high school agriculture. Courses that can be taken for a minor are:

AGEDS 211	Early Field Based Experience	1
AGEDS 310	Foundations of Agricultural Education Programs	3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	3
AGEDS 312	Science With Practice	3
AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
AGEDS 327	Survey of Agriculture and Life Sciences Communication	3

AGEDS 388	Agricultural Mechanics Applications	3
AGEDS 402	Methods of Teaching in Agriculture and Life Sciences	3
AGEDS 412	Internship in Agricultural Education and Studies	2-6
AGEDS 414	Developing Agricultural Education Programs in Non-Formal Settings	2
AGEDS 450	Farm Management and Operation	3
AGEDS 451	Agricultural Law	3
AGEDS 461	Innovation Diffusion and the Role of Agricultural and Extension Education	3
AGEDS 488	Methods of Teaching Agricultural Mechanics	3
AGEDS 490	Independent Study in Agricultural Education and Studies	1-3
AGEDS 496	Agricultural Travel Course	1-3
AGEDS 499	Undergraduate Research	arr †

† Arranged with instructor.

Visit the departmental website at [www.AgEds.iastate.edu/](http://www.AgEds.iastate.edu/). (<http://www.AgEds.iastate.edu/.html>)

**Graduate Study**

The department offers the degrees of master of science and doctor of philosophy, with a major in agricultural education; a specialization in agricultural extension education; opportunities for emphasis in international agricultural education; and a minor for students majoring in other curricula. Graduate students who have earned a bachelor's degree in an agricultural discipline may plan a course of study that leads to teacher certification. Candidates pursuing the master of science degree may do so by completing either a thesis or nonthesis program of study.

Students have an opportunity to develop competence in disciplinary foundations and ethics, program planning, learning theory, instructional methods, program leadership and administration, program evaluation, research methodologies, data analysis and interpretation, writing for publication, and grant proposal writing.

The department also cooperates in the international development studies option of the General Graduate Studies Program. Courses and workshops are offered, both on and off campus, for extension educators, teachers, and industry and government personnel.

# Agricultural and Rural Policy Studies

## AGRICULTURAL & RURAL POLICY STUDIES

### College of Agriculture and Life Sciences

Agriculture is more than just farming; it is about food, energy, and conservation. Rural is more than just small towns; it is the linkages between cities, urban consumers, and the global economy. Our major prepares students to guide policy decisions impacting agriculture, the environment, and the well-being of rural communities. In short, our major is the people and policy side of agriculture. Students will learn about the social and policy dimensions of agriculture and about strategies to promote rural resiliency and community vitality. The major will train students to engage with diverse audiences to discuss controversial issues, to promote public-private partnerships, and to lead and manage policy programs. Our goal is to give students the tools to help rural people and places thrive in the 21st century.

Our curriculum is flexible to meet the interests and needs of each student. A specialization area outside the major is required. Internships, experiential learning, and study abroad are important parts of the major. Graduates work as policy and legislative advisors, agriculture and farmer relations specialists, government affairs specialists, public information and communications officers, extension educators, community and economic developers, and in agriculture m

### Student Learning Outcomes

Students will develop the necessary skills to become effective leaders in agriculture-related companies, non-profit associations and organization, and state and local government agencies working on agriculture and rural issues. Specific learning outcomes include:

1. Making connections between agriculture, the environment, and rural communities
2. Making linkages between local, national, and global agricultural systems
3. Investigating how social, economic, and cultural systems affect decisions
4. Analyzing information and recommending solutions to guide decisions
5. Evaluating program and policy outcomes
6. Communicating information and ideas to others to guide decisions
7. Leading and managing policy programs
8. Promoting civic engagement among diverse groups

## CURRICULUM IN AGRICULTURAL & RURAL POLICY STUDIES

Administered by the Department of Sociology

### Total Degree Requirement: 120 cr.

The major in Agricultural and Rural Policy Studies requires a minimum of 120 credits and a 2.00 minimum GPA. Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits. Up to 9 P-NP credits of free electives can be applied toward the degree.

### University Requirements:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGL 302	Business Communication	3
or ENGL 309	Proposal and Report Writing	
LIB 160	Introduction to College Level Research	1
U.S. Diversity from approved list		3
International Perspectives from approved list (Met by SOC 348)		3
CALS Communication Proficiency Requirement: A grade of C or better in 6 cr. of composition (ENGL 150, ENGL 250, ENGL 302, or ENGL 309); and a C or better in speech fundamentals (COMST 214 or AGEDS 311)		
Total Credits		10-16

### CALS Requirements:

Mathematics from approved list (MATH 140, MATH 143, MATH 145, MATH 150, MATH 151, MATH 160, or MATH 165) <sup>1</sup>	3
STAT 101 Principles of Statistics	3-4
or STAT 104 Introduction to Statistics	
Physical Sciences from approved list (MTEOR 206, [CHEM 163 & CHEM 163L], GEOL 101, [GEOL 102 & GEOL 102L]) <sup>2</sup>	5
BIOL 101 Introductory Biology	3
or BIOL 211 Principles of Biology I	
Life Sciences from approved list (Met by AGRON 181)	3
Ethics from approved list (Met by SOC 325)	3
Humanities from approved list <sup>3</sup>	3
Social Sciences from approved list (Met by SOC 230)	3
AGEDS 311 Presentation and Sales Strategies for Agricultural Audiences	3
or COMST 214 Professional Communication	
Total Credits	20-30

<sup>1</sup> Mathematics approved list: <https://www.cals.iastate.edu/content/math-statistics-and-physical-sciences> (<https://www.cals.iastate.edu/content/math-statistics-and-physical-sciences/>)

<sup>2</sup> Physical Sciences approved list: <https://www.cals.iastate.edu/content/math-statistics-and-physical-sciences> (<https://www.cals.iastate.edu/content/math-statistics-and-physical-sciences/>)

<sup>3</sup> Humanities approved list: <https://www.cals.iastate.edu/student-services/humanities> (<https://www.cals.iastate.edu/student-services/humanities/>)

## Major Requirements -- Agricultural and Rural Policy Studies Core

SOC 110	Orientation to Agricultural and Rural Policy Studies	1
SOC 230	Rural Society in Transition	3
SOC 262	Data Discovery and Civic Engagement	3
SOC 264 or SOC 210	Facilitation of Public Issues in Agriculture Social & Civic Innovation	3
SOC 325	Agriculture in Transition	3
SOC 348	Global Poverty, Resources and Sustainable Development	3
SOC 350	Human Diversity in Agriculture and the Food System	3
SOC 382	Environmental Sociology	3
SOC 415	Agrifood Policy and Social Change	3
SOC 433	Strategies for Rural Resiliency and Vitality	3
SOC 444	Sociology of Food and Agricultural Systems	3
AGEDS 315 or POL S 475	Personal, Professional, and Entrepreneurial Leadership in Agriculture Management in the Public Sector	3
<b>Total Credits</b>		<b>34</b>

## Major Requirements -- Social Science Foundation

AGEDS 451	Agricultural Law	3
ECON 101	Principles of Microeconomics	3
ECON 235	Introduction to Agricultural Markets	3
POL S 283, POL S 335, POL S 344, or other approved POL S course		3
<b>Total Credits</b>		<b>12</b>

## Major Requirements -- Agricultural Science Foundation

AGRON 180	Global Agriculture in a Changing World	3
AGRON 181	Introduction to Crop Science	3
AN S 114	Survey of the Animal Industry	2
FS HN 242 or AGRON 342	The US Food System World Food Issues: Past and Present	3
<b>Total Credits</b>		<b>11</b>

## Major Requirements -- Minor or Co-Major

Minimum of 15 cr. in a declared minor (9 cr. must stand alone; 6 cr. must be at 300 or higher); or a declared co-major (30 cr. must stand alone)

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**Total Credits** **15**

## Electives

Complete 15 cr. for a second minor or co-major plus 3 cr. free electives; or complete 18 cr. free electives

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**Total Credits** **18**

## AGRICULTURAL AND RURAL POLICY STUDIES, B.S.

### Freshman

Fall	Credits Spring	Credits
SOC 110	1 ENGL 250	3
SOC 230	3 SOC 325	3
ECON 101	3 ECON 235	3
ECON 101L	1 POL S 310	3
POL S 111	3 MATH 150	3
ENGL 150	3 LIB 160	1
BIOL 101 or 211	3	
<b>17</b>		<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
SOC 345	3 SOC 382	3
ECON 362	3 Ag & Rural Policy Studies Elective	3
SP CM 212	3 P R 305	3
STAT 101	4 Ag Science Elective	3
Life Science Elective	3 Physical Science Elective	2
	Minor	3
<b>16</b>		<b>17</b>

### Junior

Fall	Credits Spring	Credits
Ag & Rural Policy Studies Elective	3 Ag & Rural Policy Studies Elective	3
POL S 344	3 Ag Science Elective	3
US Diversity Elective	3 International Perspective Elective	3
Physical Sciences Elective	3 Minor	3
Minor	3 Free Elective	3
<b>15</b>		<b>15</b>

Senior		
Fall	Credits Spring	Credits
Ag & Rural Policy Studies Elective	6 AGEDS 451	3
Minor	3 Ag & Rural Policy Studies Elective	3
Free Elective	6 Minor	3
	Free Elective	8
<b>15</b>		<b>17</b>

## GRADUATE STUDY

The department offers work for the degrees master of science and doctor of philosophy with majors in sociology and rural sociology and minor work for students majoring in other departments. For M.S. and Ph.D. departmental requirements, see Program of Graduate Study for Degrees in Sociology and Rural Sociology, available from the department office. The department offers concentrations in a number of areas, e.g., community studies and development; sociology of families, inequality, food systems, agriculture and environment; methodology; social change and development; criminology; the economy, organizations and work; and social psychology. The Department of Sociology does not offer a nonthesis master's program.

Graduates have a broad understanding of sociology, address complex societal problems, and communicate effectively with scientific colleagues and the general public in both formal and informal settings. They understand sociological theory, conduct research, and are prepared to educate college students and contribute to public policy. Although the department stipulates no language requirement for either the degree master of science or the degree doctor of philosophy, specifying competence in one or more languages may be desirable in some instances.

The department also participates in the interdepartmental program in interdepartmental majors in sustainable agriculture, transportation and water resources, and interdepartmental minors in gerontology (see Index).

## Agricultural Business

The Department of Economics offers coursework for a Bachelor of Science degree in Agricultural Business. The major in Agricultural Business prepares students for advanced studies (e.g., Masters or Ph.D. in Agricultural Economics, Law School, MBA, etc) and for careers in agricultural finance, management in agricultural supply and marketing industries, commodity merchandising and research, business research and management, farm and ranch operations, commercial farm management and appraisal, agricultural sales and marketing, agricultural reporting and public relations, agricultural extension, international

activities, and government service. A minor in Agricultural Business is also possible.

Students majoring in Agricultural Business often choose elective coursework leading to minors in the College of Agriculture and Life Sciences or the Ivy College of Business, or that emphasize specific areas within agricultural business such as finance, management, commodity analysis, research, agricultural sales and marketing, environmental economics, farm and ranch operations, international economics, agricultural extension, or government service. A major in Agricultural Business with a minor in Economics is not permitted; however, a double major in Agricultural Business and Economics is permitted.

Customization of the Agricultural Business major is possible. Students may request to pursue one of three Business Options in Finance, Marketing, or Supply Chain Management. Electing a Business Option does not change the overall requirements of the Agricultural Business major. Eligibility and coursework requirements for Business Options are maintained and approved by the Department of Economics and details are available on the department website.

## Student Learning Outcomes

Graduates from the Department of Economics at Iowa State University are expected to be able to:

1. Understand and apply concept of scarcity, marginal analysis, opportunity cost and comparative advantage.
2. Critically analyze the efficiency and equity implications of market and non-market processes of allocation.
3. Evaluate policies, regulations, and business strategies using economic models and theories.
4. Use quantitative and qualitative information to evaluate economic question.
5. Understand the determinants of differences in economic performance over time and across space.

## Curriculum in Agricultural Business

The major in Agricultural Business requires a minimum of 120 credits and a 2.00 minimum GPA. Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits. In addition, at most 9 P-NP credits of free electives can be applied toward the degree, and a minimum of 18 credits must be earned from courses taught by the Department of Economics at ISU.

International Perspective (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>): **3 cr.**  
3 cr. from approved list.

U.S. Diversity (<http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>): **3 cr.**

3 cr. from approved list.

**Communication/Library: 13 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
One of the following		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
One of the following		3
SP CM 212	Fundamentals of Public Speaking	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
COMST 214	Professional Communication	
LIB 160	Introduction to College Level Research	1
Communication Proficiency Requirement: A grade of C or better in ENGL 250, a C or better in either ENGL 150 or (ENGL 302 or ENGL 309 or ENGL 314), and a C or better in the speech fundamentals course (SP CM 212 or AGEDS 311).		

**Total Credits** 13

**Humanities and Social Sciences: 6 cr.**

ECON 102	Principles of Macroeconomics	3
Three credits from approved course list.		3

**Total Credits** 6

**Ethics: 3 cr.**

3 cr. from approved list.

**Life Sciences: 6 cr.**

One of the following:		3
BIOL 101	Introductory Biology	
BIOL 211	Principles of Biology I	
Three credits from approved course list.		3

**Total Credits** 6

**Mathematics: 10-11 cr.**

One of the following:		4
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
One of the following:		3-4
ECON 207	Applied Economic Optimization	
MATH 166	Calculus II	
STAT 226	Introduction to Business Statistics I	3

**Physical Sciences: 5 cr.**

5 credits from approved course list. 5

**Total Credits** 5

**Agricultural, Food, or Natural Resources Sciences: 6 cr.**

6 cr. from approved list.

**General Economics: 9-10 cr.**

ECON 101	Principles of Microeconomics	3
ECON 301	Intermediate Microeconomics	3-4
One of the following:		3
ECON 302	Intermediate Macroeconomics	
ECON 353	Money, Banking, and Financial Institutions	
ECON 492	Graduating Senior Survey	R

**Total Credits** 9-10

**Business and Agricultural Business: 32 cr.**

ACCT 284	Financial Accounting	3
FIN 301	Principles of Finance	3
Six credits from ACCT 285 or any 300-489 ACCT, FIN, MKT, MGMT, MIS, or SCM courses.		6
ECON 110	Orientation in Agricultural Business	1
ECON 235	Introduction to Agricultural Markets	3
ECON 292	Career Seminar	1
Three credits from STAT 326 or DS 201		3
Nine credits of ECON 230-239, 300-389, 400-489 courses.		9
Three credits of 400-489 level ECON courses.		3
<b>Total Credits</b>		<b>32</b>

**Electives: 22-24 cr.**

Agricultural Business majors seeking a double major in Economics must take an additional 9 credits of economics courses beyond those required for the Economics major for a total of 47 credits in economics, and must earn a minimum GPA of 2.0 across ECON 101 Principles of Microeconomics, ECON 102 Principles of Macroeconomics, ECON 301 Intermediate Microeconomics, and ECON 302 Intermediate Macroeconomics, with no grade in these lower than a C#.

## Bachelor of Science, Agricultural Business

**Freshman**

Fall	Credits Spring	Credits
ECON 110	1 ECON 102	3
ECON 101	3 ECON 235	3
ECON 101L	1 BIOL 101 or 211	3
ENGL 150	3 ECON 207 or MATH 166	3-4
LIB 160	1 Ag Science or Humanities	3
MATH 160 or 165	4	

Ag Science or Humanities	3	
	<b>16</b>	<b>15-16</b>

**Sophomore**

Fall	Credits Spring	Credits
ACCT 284	3 ENGL 250	3
ECON 301	3-4 STAT 326 or DS 201 <sup>b</sup>	3
ECON 292	1 CHEM 163 or PHYS 131	4
STAT 226	3 CHEM 163L or PHYS 131L	1
Ag Science or Humanities	3 International or Diversity	3
	Life Sciences	3
	<b>13-14</b>	<b>17</b>

**Junior**

Fall	Credits Spring	Credits
Business elective <sup>a</sup>	3 ECON 230-239, 300-389, or 400-489	3
ECON 230-239, 300-389, or 400-489	6 FIN 301	3
SP CM 212 or AGEDS 311	3 International or Diversity	3
Ethics	3 ECON 302 or 353	3
	Elective	3
	<b>15</b>	<b>15</b>

**Senior**

Fall	Credits Spring	Credits
Business elective <sup>a</sup>	3 ECON 400-489	3
ENGL 302, 309, or 314	3 ECON 492	R
Electives	9 Electives	12
	<b>15</b>	<b>15</b>

a. Select six credits from ACCT 285 or any 300-489 ACCT, FIN, MKT, MGMT, MIS, or SCM courses.

<sup>b</sup>. Students majoring in Economics or adding the Finance Business Option must take STAT 326. Students must take at least 1 STAT course from Iowa State for graduation.

**Agricultural Business Minor**

The Department of Economics offers a minor in Agricultural Business. The minor requires at least 15 credits, including 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other Department, College, or University requirement. Courses to be included in the minimum of 15 credits include the following:

ECON 101	Principles of Microeconomics	3
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3

ECON 301	Intermediate Microeconomics	3-4
Three credits of ECON courses from: 300-389, 400-489 courses.		3

The Department of Economics has concurrent Bachelor of Science / Master of Science (BS/MS) programs designed especially for seniors who wish to pursue advanced studies. Concurrent BS/MS programs are: agricultural business (BS) with agricultural economics (MS) or with economics (MS). The concurrent BS/MS program allows seniors to complete an MS degree within 12 months of BS graduation.

For more information about our concurrent undergraduate and graduate programs in Agricultural Economics, visit: <https://www.econ.iastate.edu/iowa-state-ms-econ-programs> (<https://www.econ.iastate.edu/iowa-state-ms-econ-programs/>)

See Master of Science or Ph.D. in Agricultural Economics.

## Agricultural Studies

### OVERVIEW

Administered by the Department of Agricultural Education and Studies

For undergraduate curricula in agriculture and life sciences education, and agricultural studies, leading to the degree of bachelor of science, see College of Agriculture and Life Sciences, Curricula.

The department offers two curricula for students desiring to enter careers in agriculture and related fields. These curricula are agriculture and life sciences education and agricultural studies. The agricultural and life sciences education curriculum prepares persons for careers as agricultural education instructors, and educational specialists for industry, nonprofit organizations, and governmental agencies. The agricultural studies curriculum has two options, production and management and multidisciplinary. Students are prepared for careers in production agriculture and agricultural industry. Graduates of both curricula accept positions in agricultural business, industry, agencies, and production agriculture.

**Student Learning Outcomes**

Graduates will have a broad base of agricultural knowledge, and will be skilled in decision making, planning, organizing, presenting, and evaluating information. Through the successful completion of the required coursework, active participation in clubs and organizations, and the acquisition of technical skills and experiences associated with work experiences, internships, and international travel, graduates of our baccalaureate programs meet the university, college, and departmental outcomes in the following nine areas:

1. professional, interpersonal, and cross-cultural communications
2. problem solving and critical thinking
3. leadership



4. entrepreneurship
5. life-long learning
6. ethics
7. environmental awareness
8. U.S. diversity
9. international perspectives.

More information regarding the departmental learning outcomes can be found at [www.ageds.iastate.edu/](http://www.ageds.iastate.edu/). (<http://www.ageds.iastate.edu/>)

## Curriculum in Agricultural Studies

Administered by the Department of Agricultural Education and Studies. Students are encouraged to develop one or more areas of concentration in agricultural sciences and economics.

### Production and Management Option

#### Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

#### University Requirements.:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
	International Perspectives from approved list	3
LIB 160	Introduction to College Level Research	1
	US Diversity from approved list	3
<b>Total Credits</b>		<b>13</b>

#### CALS Requirements

##### Communications Proficiency:

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	3
BIOL 101 or BIOL 211	Introductory Biology Principles of Biology I	3
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
ECON 101	Principles of Microeconomics	3
	Ethics Elective from approved list	3
	Humanities Elective from approved list	3
	Life Science elective from approved list	3
MATH 140	College Algebra	3
STAT 104	Introduction to Statistics	3
<b>Total Credits</b>		<b>29</b>

#### Major Requirements

ACCT 284	Financial Accounting	3
AGEDS 110	Professional Development in Agricultural Education and Studies: New Student Seminar	1
AGEDS 215	Professional Development in Agricultural Education and Studies: Career Seminar	1
AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
AGEDS 327	Survey of Agriculture and Life Sciences Communication	3
AGEDS 450	Farm Management and Operation	3
AGEDS 451	Agricultural Law	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
AGRON 280	Crop Development, Production and Management	3
AN S 101	Working with Animals	2
AN S 114	Survey of the Animal Industry	2
	And 6 credit hours from AN S, any level or approved list	6
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3
	Econ 300 Level from Department Approved List	3
NREM 120 or NREM 130	Introduction to Renewable Resources Natural Resources and Agriculture	3
<b>Total Credits</b>		<b>48</b>

#### Other Required Course:

##### Electives: Select courses to get to 120 credits.

No more than 4 cr. of or 397 may count toward graduation.

No more than 6 cr. of 490 may count toward graduation.

### Multidisciplinary Option

#### Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

#### University Requirements

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
	International Perspective from approved list	3
	US Diversity from approved list	3
<b>Total Credits</b>		<b>13</b>

#### CALS Requirements

##### Communications Proficiency:

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

BIOL 101	Introductory Biology	3
or BIOL 211	Principles of Biology I	
Ethics Elective from approved list		3
Humanities Elective from approved list		3
Life Science Elective from approved list		3
MATH 140	College Algebra	3
Physical Science Elective from approved list		5
Speech Elective from approved list		3
Social Science Elective from approved list		3
STAT 104	Introduction to Statistics	3
<b>Total Credits</b>		<b>29</b>

### Major Requirements Agriculture and Life Sciences Core

AGEDS 110	Professional Development in Agricultural Education and Studies: New Student Seminar	1
AGEDS 215	Professional Development in Agricultural Education and Studies: Career Seminar	1
AGEDS 412	Internship in Agricultural Education and Studies	3
AGEDS 490C	Business, Industry, and Production Agriculture	3
Select one CALS area, including 6 credits at 300-400 level taken at Iowa State *		15
Select one CALS area, including 6 credits at 300-400 level taken at Iowa State *		15
Select one other area, including 6 credits at 300-400 level taken at Iowa State *		15
<b>Total Credits</b>		<b>53</b>

\* An individual course may only apply towards one area.

### Other Required Course: Electives: Select courses to get to 120 credits. Preveterinary Studies

Preparation for admission to veterinary medicine may be accomplished through the agricultural studies curriculum.

Agricultural Studies, B.S.

Production and Management Option

### Freshman

Fall	Credits Spring	Credits
AGEDS 110	1 AN S 114	2
ECON 101	3 AGRON 182	3
NREM 120 or 130	3 AN S 101	2
MATH 140	3 STAT 104	3
ENGL 150	3 ENGL 250	3
LIB 160	1 Humanities Elective	3

AGRON 181	3
	<b>17</b>
	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
AGEDS 215	1 ACCT 284	3
BIOL 101	3 Life Science Elective	3
AGRON 280	3 U.S. Diversity Elective	3
Intl Perspective Elective	3 AN S Elective	3
ECON 235	3 Elective	3
	<b>13</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
AN S Elective	3 AGEDS 311	3
AGEDS 315	3 ECON 230	3
CHEM 163	4 Ethics Elective	3
CHEM 163L	1 Elective	7
Elective	6	
	<b>17</b>	<b>16</b>

### Senior

Fall	Credits Spring	Credits
AGEDS 450	3 AGEDS 451	3
AGEDS 327	3 Elective	11
Econ Elective - Select from Approved List	3	
Elective	3	
	<b>12</b>	<b>14</b>

**Total Credits: 120**

Multidisciplinary Option

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 BIOL 101	3
AGEDS 110	1 ENGL 250	3
LIB 160	1 International Perspectives	3
MATH 140	3 Humanities Elective	3
Area Course	3 Area Course	3
Social Science Elective	3	
	<b>14</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
AGEDS 215	1 Free Elective	6
Free Elective	4 Area Course	3

Area Course	3 Area Course	3
Area Course	3 US Diversity Elective	3
Physical Science Elective	5	
	<b>16</b>	<b>15</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AGEDS 315	3 Speech Elective	3
STAT 104	3 Area Course	3
Ethics Elective	3 Area Course	3
Area Course	3 Area Course	3
Free Elective	3 Free Elective	3
	<b>15</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Free Elective	3 Free Elective	9
Life Science Elective	3 Area Course	3
Area Course	3 Area Course	3
Area Course	3	
Area Course	3	
	<b>15</b>	<b>15</b>

**Total Credits: 120**

\* A 2.00 grade point average is required.

## Agricultural Systems Technology

The Department of Agricultural and Biosystems Engineering offers a bachelor of science degree in Agricultural Systems Technology (AST). Students majoring in AST choose between two options: Agricultural and Biosystems Management or Machine Systems. The department also offers a minor in Agricultural Systems Technology.

Successful AST graduates gain knowledge, skills, and abilities in solving technical problems, understanding the design process, excelling in authentic leadership, being aware of safety issues, having a quality orientation, effectively managing projects, and having a systems-thinking perspective. This translates to a holistic approach where AST graduates apply science, technology and engineering principles to manage complex agricultural and other production systems, including how the constituent sub-systems are interrelated and the broader impact of these systems.

Graduates find careers within a variety of agricultural industries, businesses, and organizations in the fields of agricultural machinery; off-road equipment; food, feed and grain processing; water quality; biorenewable resources; precision agriculture; or livestock production systems.

Common job duties of AST Agricultural and Biosystems Management graduates include:

- technical support
- operations management
- production supervision
- grain elevator management

Common job duties of AST Machine Systems graduates include:

- precision agriculture support
- testing or sales management
- technical support
- maintenance supervision

## Student Learning Outcomes

Upon graduation, all AST students should be able to:

1. Apply knowledge of mathematics, science, and applied engineering to identify and solve applied science and technology problems
2. Develop and conduct experiments, and analyze and interpret resulting data
3. Evaluate and adapt systems, components, processes to meet specified needs
4. Function effectively on multi-disciplinary teams
5. Communicate effectively, ethically, and professionally in written, oral, and other formats to technical and non-technical audiences
6. Understand the potential impacts and limitations of solutions in global and societal contexts
7. Recognize the need for, and demonstrate an ability to, engage in life-long learning
8. Effectively apply modern scientific and technical tools necessary for professional practice to address contemporary issues in applied engineering and technology

Upon graduation, AST students in the agricultural and biosystems management (ABM) option should be able to:

1. Design, implement, and evaluate best practices for the management of global and natural resource systems
2. Integrate and utilize agricultural and biosystems applied engineering and technology to address contemporary issues in bio-based industries
3. Evaluate the factors impacting the complex systems that sustain water, air, soils, food, and feed

Upon graduation, AST students in the machine systems (MS) option should be able to:

1. Specify, manage, and test machine systems in the context of a complete agricultural, biological production or processing system
2. Use and apply the technology of machine systems including power and information flows, function and interaction with biological materials
3. Perform an energy and cost analyses of complete machine systems to ensure the success and sustainability of an enterprise

For more information about the AST degree: <http://www.abe.iastate.edu/undergraduate-students/agricultural-systems-technology> (<http://www.abe.iastate.edu/undergraduate-students/agricultural-systems-technology/>)

### Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### Communications Proficiency:

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

### Communication/Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
One of the following:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
AGEDS 327	Survey of Agriculture and Life Sciences Communication	
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
COMST 214	Professional Communication	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
LIB 160	Introduction to College Level Research	1
<b>Total Credits</b>		<b>13</b>

### Mathematical, Physical, and Life Sciences: 25 cr.

MATH 145	Applied Trigonometry	3
MATH 151	Calculus for Business and Social Sciences	3
STAT 104	Introduction to Statistics	3
CHEM 163	College Chemistry	4
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
CHEM 163L	Laboratory in College Chemistry	1
One of the following:		3
BIOL 101	Introductory Biology	

BIOL 211	Principles of Biology I	
BIOL 212	Principles of Biology II	
BIOL 251	Biological Processes in the Environment	
Life Sciences Elective from approved College of Agriculture and Life Sciences list		3
<b>Total Credits</b>		<b>25</b>

### Business, Humanities, Ethics, and Social Sciences: 18 cr.

ACCT 284	Financial Accounting	3
ECON 101	Principles of Microeconomics	3
TSM 370	Occupational Safety (Ethics)	3
Humanities course from College of Agriculture and Life Sciences list		3
International Perspectives course from University list		3
U.S. Diversity course from University list		3
<b>Total Credits</b>		<b>18</b>

### Technical Core: 28 cr.

TSM 110	Introduction to Technology	1
TSM 111	Experiencing Technology	1
TSM 115	Solving Technology Problems	3
TSM 116	Introduction to Design in Technology	3
TSM 201	Preparing for Workplace Seminar	1
TSM 210	Fundamentals of Technology	3
TSM 214	Managing Technology Projects	1
TSM 270	Principles of Injury Prevention and Safety	3
TSM 310	Total Quality Improvement	3
TSM 363	Electrical Power and Control Systems for Agriculture and Industry	4
TSM 397	Summer Internship in Technology	R
or TSM 399	Internship in Technology	
TSM 415	Applied Project Management in Technology	2
TSM 416	Technology Capstone	3
<b>Total Credits</b>		<b>28</b>

TSM 397 or 399 may count toward graduation

### Agricultural and Biosystems Management Option: 36 cr.

TSM 322	Preservation of Grain Quality	3
TSM 322L	Preservation of Grain Quality Laboratory	1
TSM 324	Soil and Water Conservation Management	3
TSM 325	Biorenewable Systems	3
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management	3
TSM 330	Agricultural Machinery and Power Management	3
TSM 433	Precision Agriculture	3
TSM 455	Feed Processing and Technology	3

ECON 230	Farm Business Management	3
11 credits of free electives		11
<b>Total Credits</b>		<b>36</b>

**Machine Systems option: 36 cr.**

TSM 216	Advanced Technical Graphics, Interpretation, and CAD	2
A B E 271, A B E 272, or A B E 273		1
TSM 240	Introduction to Advanced Manufacturing and Metals Processing	3
TSM 330	Agricultural Machinery and Power Management	3
TSM 335	Tractor Power	4
TSM 337	Fluid Power Systems Technology	3
TSM 433	Precision Agriculture	3
TSM 443	Statics and Strength of Materials for Technology	3
TSM 465	Automation Systems	3
11 credits of free electives		11
<b>Total Credits</b>		<b>36</b>

## Agricultural Systems Technology, B.S. - Machine Systems

**First Year**

Fall	Credits	Spring	Credits
TSM 110	1	TSM 111	1
TSM 116	3	TSM 115	3
ENGL 150	3	MATH 151	3
LIB 160	1	PHYS 131	4
MATH 145	3	PHYS 131L	1
CHEM 163	4	US Diversity - see list <sup>1</sup>	3
CHEM 163L	1		
<b>16</b>		<b>15</b>	

**Second Year**

Fall	Credits	Spring	Credits
TSM 201	1	TSM 216	2
TSM 210	3	A B E 271, 272, or 273	1
TSM 214	1	TSM 240	3
TSM 270	3	STAT 104	3
ACCT 284	3	BIOL 101 or 211	3
ENGL 250	3	ECON 101	3
<b>14</b>		<b>15</b>	

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
TSM 335	4	TSM 310	3	TSM 397 or 399	R
TSM 363	4	TSM 330	3		
TSM 433	3	TSM 337	3		
ENGL 302, 309, 314, or AGEDS 327	3	Humanities - See list <sup>2</sup>	3		
		Life Science - See list <sup>3</sup>	3		
<b>14</b>		<b>15</b>		<b>0</b>	

**Fourth Year**

Fall	Credits	Spring	Credits
TSM 415	2	TSM 370	3
Elective	6	TSM 416	3
International Perspectives - see list <sup>1</sup>	3	TSM 443	3
SP CM 212, COMST 214, or AGEDS 311	3	TSM 465	3
		Elective	5
<b>14</b>		<b>17</b>	

<sup>1</sup> U.S. Diversity and International Perspectives (<https://www.registrar.iastate.edu/students/div-ip-guide/>)<sup>2</sup> Humanities Course List (<https://www.cals.iastate.edu/student-services/humanities/>)<sup>3</sup> Life Sciences Course List (<https://www.cals.iastate.edu/student-services/life-science/>)<sup>4</sup> Ethics Course List (<https://www.cals.iastate.edu/student-services/ethics/>)

## Agricultural Systems Technology, B.S. - Agricultural &amp; Biosystems Management

**First Year**

Fall	Credits	Spring	Credits
TSM 110	1	TSM 111	1
TSM 116	3	TSM 115	3
ENGL 150	3	MATH 151	3
LIB 160	1	PHYS 131	4
MATH 145	3	PHYS 131L	1

CHEM 163	4	ECON 101	3
CHEM 163L	1		
<b>16</b>		<b>15</b>	

**Second Year**

Fall	Credits	Spring	Credits
TSM 201	1	TSM 322	3
TSM 210	3	TSM 322L	1
TSM 214	1	BIOL 101 or 211	3
TSM 270	3	ECON 230	3
ACCT 284	3	STAT 104	3
ENGL 250	3	SP CM 212, COMST 214, or AGEDS 311	3
<b>14</b>		<b>16</b>	

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
TSM 325	3	TSM 310	3	TSM 397 or 399	R
TSM 327	3	TSM 324	3		
TSM 363	4	TSM 370	3		
ENGL 302, 309, 314, or AGEDS 327	3	Life Science - see list <sup>3</sup>	3		
US Diversity - see list <sup>1</sup>	3	Elective	3		
<b>16</b>		<b>15</b>		<b>0</b>	

**Fourth Year**

Fall	Credits	Spring	Credits
TSM 415	2	TSM 416	3
TSM 433	3	TSM 330	3
TSM 455	3	International Perspectives - see list <sup>1</sup>	3
Humanities - see list <sup>2</sup>	3	Elective	3
Elective	5		
<b>16</b>		<b>12</b>	

<sup>1</sup> U.S. Diversity and International Perspectives (<https://www.registrar.iastate.edu/students/div-ip-guide/>)

<sup>2</sup> Humanities Course List (<https://www.cals.iastate.edu/student-services/humanities/>)

<sup>3</sup> Life Science Course List (<https://www.cals.iastate.edu/student-services/life-science/>)

<sup>4</sup> Ethics Course List (<https://www.cals.iastate.edu/student-services/ethics/>)

**Minor in agricultural systems technology**

The Department of Agricultural and Biosystems Engineering offers a minor in agricultural systems technology which may be earned by completing a minimum of 15 credits of technology systems management courses, which includes:

TSM 115	Solving Technology Problems	3
TSM 210	Fundamentals of Technology	3
9 credits from:		9
TSM 310	Total Quality Improvement	
TSM 322	Preservation of Grain Quality	
TSM 322L	Preservation of Grain Quality Laboratory	
TSM 324	Soil and Water Conservation Management	
TSM 325	Biorenewable Systems	
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management	
TSM 330	Agricultural Machinery and Power Management	
TSM 335	Tractor Power	
TSM 337	Fluid Power Systems Technology	
TSM 363	Electrical Power and Control Systems for Agriculture and Industry	
TSM 393E	Topics in Technology: Chemical Application Systems	
TSM 393F	Topics in Technology: Agricultural Safety and Health	
TSM 433	Precision Agriculture	
TSM 455	Feed Processing and Technology	
TSM 457	Feed Safety, Ingredient Quality and Analytics	

• At least six (6) credits of 300-level or higher TSM classes (from the classes listed above)

• At least nine (9) credits that are not used to meet any other department, college, or university requirement.

## Agronomy

### Undergraduate Study

Agronomy is the science and technology of producing plants that serve humans, using practices essential for maintaining and improving life. The Department of Agronomy offers a major leading to a degree of bachelor of science (BS) in agronomy. Graduates have the theoretical and practical knowledge needed for efficient and sustainable crop production. They



are skilled in critical thinking, problem solving, communicating, and working effectively with others. They understand the ethical, cultural, and environmental dimensions of issues facing agronomists globally.

An agronomy major prepares students for employment in crop production and soil management, yield forecasting, precision farming, plant breeding, agricultural business and industry, agricultural service organizations, environmental and natural resource management, and farm management. Graduates pursue careers in the seed, fertilizer, and agricultural chemical industries as field agronomists, crop and soil management specialists, research technicians, sales and marketing specialists, and production managers. State and federal agencies employ agronomists as extension specialists, county extension directors, environmental and natural resource specialists, research associates, soil surveyors, soil conservationists, grain inspectors, integrated pest managers, land appraisers, agricultural lenders, and other science-based professionals.

An agronomy major also prepares students for graduate school. We offer a concurrent BS/MBA degree. About a quarter of our students immediately continue into research-based MS and PhD programs. As an undergraduate, there are many opportunities to be involved in research.

Department of Agronomy website - <http://www.agron.iastate.edu/>.  
(<http://www.agron.iastate.edu/>)

## Student Learning Outcomes

Upon graduation, students should be able to:

**KNOWLEDGE:** Graduates of our bachelor's degree program will demonstrate knowledge of the scientific principles and practices needed for success as an agronomist.

**INTEGRATION AND PROBLEM-SOLVING:** Graduates of our bachelor's degree program will integrate knowledge and skills to systematically assess, critically analyze, and sustainably manage agronomic systems.

**PROFESSIONALISM AND CAREER READINESS:** Graduates of our bachelor's degree program will demonstrate professional skills and career readiness.

**COMMUNICATION:** Graduates of our bachelor's degree program will communicate and engage effectively with diverse audiences.

**DIVERSE WORLDVIEWS:** Graduates of our bachelor's degree program will demonstrate knowledge of diverse worldviews that affect agronomic practices.

**ETHICAL, ENVIRONMENTAL, AND ECOLOGICAL ASPECTS:** Graduates of our bachelor's degree program will demonstrate knowledge of the ethical, environmental, and ecological aspects of agronomic practices.

## Curriculum in Agronomy

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA. A minimum of 15 credits of agronomy courses must be earned at Iowa State and not transferred from other institutions.

### International Perspective: 3 cr.

3 cr. from approved International Perspective list: <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)

### U.S. Diversity: 3 cr.

3 cr. from approved U.S. Diversity list: <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)

### Communication/Library: 13 cr.

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
LIB 160	Introduction to College Level Research	1

One of the following:

ENGL 302	Business Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 312	Communicating Science and Public Engagement	3
ENGL 314	Technical Communication	3

### Humanities: 3 cr.

3 cr. from approved humanities list: <http://www.cals.iastate.edu/student-services/humanities> (<http://www.cals.iastate.edu/student-services/humanities/>)

### Social Sciences: 3 cr.

3 cr. from approved social sciences list: <http://www.cals.iastate.edu/student-services/social-sciences> (<http://www.cals.iastate.edu/student-services/social-sciences/>)

### Ethics: 3 cr.

3 cr. from approved ethics list: <http://www.cals.iastate.edu/student-services/ethics> (<http://www.cals.iastate.edu/student-services/ethics/>)

### Mathematical Sciences: 6 cr.

MATH 140	College Algebra	3
STAT 104	Introduction to Statistics	3

**Physical Sciences: 8 cr.**

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	5
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One of the following:

AGRON 259	Organic Compounds in Plants and Soils	3
BBMB 221	Structure and Reactions in Biochemical Processes	3
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	4

**Life and Biological Sciences: 7 cr.**

BIOL 212 & 212L	Principles of Biology II and Principles of Biology Laboratory II	4
AGRON 320 or BIOL 313	Genetics, Agriculture and Biotechnology Principles of Genetics	3

**Supporting Sciences: 15 cr.**

Courses cannot be used to fulfill any other university, college, or Agronomy requirements. At least 9 cr. must be in courses numbered 300 or above.

This requirement can be met in one of three ways:

- Complete at least 3 credits in basic or mathematics-intensive discipline (ACCT, BBMB, BIOL, CHEM, COM S, ECON, All Engineering, GEOL, GEN, MATH, MTEOR, PHYS, STAT) as well as at least 6 additional credits in AN S, BIOL, BBMB, ENSCI, ENT, GEOL, HORT, GEN, MICRO, NREM, PL P, TSM. The other 6 credits can be a combination of the above department's courses and/or AGRON.
- Complete the courses needed to fulfill a certificate or second major that complements the student's academic and professional goals.
- By the end of the third semester before graduation, petition the Agronomy Curriculum Committee with a specific set of courses designed around "keeper of the land," "builder of genetic diversity," "explorer of plant life," "developer of bio-energy," "confronter of world hunger," or "designer of sustainable systems."

**Agronomy Core: 44 cr.**

AGRON 105	Leadership Experience	R
AGRON 110	Professional Development in Agronomy: Orientation	1
AGRON 180	Global Agriculture in a Changing World	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
AGRON 183	Basic Skills for Agronomists	1
AGRON 206	Introduction to Weather and Climate	3
AGRON 210	Professional Development in Agronomy: Career Planning	1

AGRON 279	Field Exploration of Agronomy	3
AGRON 280	Crop Development, Production and Management	3
AGRON 282	Soil Conservation and Land Use	3
AGRON 310 or AGRON 311	Professional Development in Agronomy: Work Experience Professional Internship in Agronomy	R
AGRON 316	Crop Structure-Function Relationships	3
AGRON 342 or AGRON 450	World Food Issues: Past and Present Issues in Sustainable Agriculture	3
AGRON 354 & 354L	Soils and Plant Growth and Soils and Plant Growth Laboratory	4
AGRON 360 or AGRON 392	Environmental Soil Science Systems Analysis in Crop and Soil Management	3
AGRON 410	Professional Development in Agronomy: Senior Forum	1
Additional AGRON credits at the 300-400 level		6

**Electives: 20 cr.**

Additional free electives	20
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Agronomy, B.S.

**Freshman**

Fall	Credits Spring	Credits
AGRON 110	1 AGRON 181	3
AGRON 180	3 AGRON 182	3
AGRON 183	1 BIOL 212	3
CHEM 163 or 177	4 BIOL 212L	1
CHEM 163L or 177L	1 ENGL 250	3
ENGL 150	3 Math or Social Sciences	3
LIB 160	1	
Math or Social Sciences	3	
<b>17</b>		<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
AGRON 206	3 AGRON 282	3
AGRON 210	1 AGEDS 311 or SP CM 212	3
AGRON 279	3 Organic Chemistry: AGRON 259, BBMB 221, OR CHEM 231 & L	3-4
AGRON 280	3 Elective	3
STAT 104	3 Supporting Sciences	3
Humanities	3	
<b>16</b>		<b>15-16</b>

<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AGRON 316	3 AGRON 320 or BIOL 313	3
AGRON 354	3 AGRON 342 or 450	3
AGRON 354L	1 ENGL 302, 309, 312, or 314	3
Elective	6 International Perspectives	3
Supporting Sciences	3 Supporting Sciences (300+)	3
	<b>16</b>	<b>15</b>

<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Additional Agronomy credits (300+)	6 AGRON 360 or 392	3
Elective	5 AGRON 410	1
Ethics	3 Elective	6
U.S. Diversity	3 Supporting Sciences (300+)	6
	<b>17</b>	<b>16</b>

## Minor - Agronomy

A minor in agronomy is earned by taking 18 credits consisting of the following:

- 6 credits of required courses;
- 3-6 credits of foundation courses;
- 6-9 credits of supporting courses.

At least 9 credits must be taken at Iowa State University with at least 6 credits numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

A student may use up to:

- 3 credits of AGRON 496A or AGRON 496B;
- **Or** up to 2 credits from AGRON 331 or AGRON 370;
- **Or** up to 1 credit of AGRON 490.

Required Courses (6 credits):

AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
Foundation Courses - One or two courses from the list below (3-6 credits):		
AGRON 180	Global Agriculture in a Changing World	3
AGRON 206	Introduction to Weather and Climate	3
AGRON 280	Crop Development, Production and Management	3
AGRON 282	Soil Conservation and Land Use	3

Supporting Courses (6-9 credits, 6 credits of which must be 300+ level):

AGRON 217	Weed Identification	1
AGRON 259	Organic Compounds in Plants and Soils	3
AGRON 270	Geospatial Technologies	3
AGRON 316	Crop Structure-Function Relationships	3
AGRON 317	Principles of Weed Science	3
AGRON 320	Genetics, Agriculture and Biotechnology	3
AGRON 334	Forage Crop Management	3
AGRON 338	Seed Science and Technology	3
AGRON 354	Soils and Plant Growth	3
AGRON 360	Environmental Soil Science	3
AGRON 392	Systems Analysis in Crop and Soil Management	3
AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 421	Introduction to Plant Breeding	3
AGRON 450	Issues in Sustainable Agriculture	3
AGRON 459	Environmental Soil and Water Chemistry	4
AGRON 463	Soil Formation and Landscape Relationships	3
AGRON 477	Soil Physics	3
AGRON 484	Organic Agricultural Theory and Practice	3
AGRON 485	Soil and Environmental Microbiology	3
AGRON 497	Agroecology Field Course	3

## SOIL SCIENCE CERTIFICATE

### Purpose

The certificate in soil science will prepare students with the skills needed for successful careers in the field of soil science. Soil science has key roles in achieving goals of sustainability as demonstrated by the functions of soil and their ecosystem services. Namely, soil is an important factor in addressing issues of food scarcity, water management, climate change, biodiversity loss, and human health. Students who complete the Iowa State University soil science certificate program will qualify for federal employment as a soil scientist. In addition, students completing the certificate will have met the educational component of the Soil Science Society of America's requirements for certification as a professional soil scientist and all U.S. states' educational criteria for licensure as a professional soil scientist.

### Requirements

The certificate in soil science requires the completion of 31 credit hours, including a foundation course in soil science, 15 credits in supporting biological, physical, or Earth sciences, as well as 13 credits from approved categories of soil science courses.

At least 9 credits must be taken in soil science courses numbered at the 300-level or above.

At least 9 credits used for the certificate cannot be used to meet any other department, college, or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Courses for the certificate cannot be taken on a pass/not-pass basis.

## Course Requirements for Soil Science Certificate

**Foundation:** 3 credits of required core course.

AGRON 182	Introduction to Soil Science	3
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**Supporting Biological, Physical, or Earth Sciences:** Choose 15 credits from approved list consisting of courses from the following designators: A B E, AGRON, A ECL, BIOL, CHEM, C E, C R P, ENSCI, ENT, FOR, GEOL, HORT, L A, MTEOR, MICRO, NREM, PHYS.

**Soil Science:** Choose 13 credits with at least 2 credits from each of the following categories.

### Soil Physical Properties or Soil Water Relationships (2 credits)

AGRON 282	Soil Conservation and Land Use	3
AGRON 360	Environmental Soil Science	3
AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 477	Soil Physics	3
A B E 431	Design and Evaluation of Soil and Water Conservation Systems	3
TSM 324	Soil and Water Conservation Management	3

### Soil Chemistry (2 credits)

AGRON 259	Organic Compounds in Plants and Soils	3
AGRON 459	Environmental Soil and Water Chemistry	4

### Soil Biology (2 credits)

AGRON 354	Soils and Plant Growth	3
AGRON 354L	Soils and Plant Growth Laboratory	1
AGRON 485	Soil and Environmental Microbiology	3

### Soil Morphology and Geography (2 credits)

AGRON 270	Geospatial Technologies	3
AGRON 370	Field Experience in Soil Description and Interpretation	1
AGRON 463	Soil Formation and Landscape Relationships	3

The Soil Science Certificate may be earned at the same time as an ISU baccalaureate degree or after the completion of an associate of arts (AA) or associate of science (AS) degree or a baccalaureate degree from any accredited institution.

Information on the concurrent Agronomy bachelors degree and MBA can be located here (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

## Graduate Study Introduction

Agronomy is the science and technology of producing plants that serve humans, using practices essential for maintaining and improving life. The Department of Agronomy administers Master of Science (MS) and Doctor of Philosophy (PhD) degree programs in four different graduate majors that emphasize different disciplines of agronomy. These majors are: Agricultural Meteorology; Crop Production and Physiology; Plant Breeding; and Soil Science. A fifth graduate major, Agronomy, offers both an MS and a Graduate Certificate through distance education suitable for professionals working in industry or government, as well as a graduate minor for on-campus students.

## Admission

To be fully admitted, prospective graduate students must have an undergraduate GPA of at least a 3.00 GPA (4.00 scale) or rank in the upper one-half of their undergraduate class. Non-native English speakers must take the Test of English as a Foreign Language (TOEFL). Students applying to the Agricultural Meteorology and Plant Breeding graduate majors must take the Graduate Record Examination (GRE). For all of the majors except Agronomy, a faculty member of the graduate major must agree to be the major professor before the student is admitted.

## Program of Study

The academic courses used to satisfy requirements for a graduate degree compose a student's Program of Study (POS). The POS must be approved by the student's POS Committee. For the MS in Agronomy, the POS Committee must be composed of at least two faculty who are both members of the Graduate Major in Agronomy. For the other four majors at the MS degree level, at least three faculty must serve on a POS Committee. Two of the three must be members of the major, and at least one must be a member of a different graduate major. At the PhD level the POS Committee must have at least five members, of which at least three must be faculty in the major, and at least one a member of a different graduate major. If the student is pursuing a graduate minor, either as part of an MS or PhD, a graduate faculty member representing the minor must serve on the POS Committee.

## Agronomy

The POS for the MS in Agronomy is fixed and consists of the following:

AGRON 501	Crop Growth and Development	3
AGRON 502	Chemistry, Physics, and Biology of Soils	3
AGRON 503	Climate and Crop Growth	3
AGRON 511	Crop Improvement	3

AGRON 512	Soil-Plant Environment	3
AGRON 513	Data Science for Agricultural Professionals	3
AGRON 514	Integrated Pest Management	3
AGRON 531	Crop Ecology and Management	3
AGRON 532	Soil Management	3
AGRON 533	Crop Protection	3
AGRON 591	Agronomic Systems Analysis	3
AGRON 592	Current Issues in Agronomy	3
AGRON 594	Agronomy MS Practicum	1
AGRON 599M	Agronomy (3 credits total over 2 semesters: 1 credit for proposal. 2 credits for final oral exam.)	arr †

† Arranged with instructor.

## All Other Degrees

The courses in each student's POS will vary depending on the major and the student's interests. Only a maximum of three 400-level courses or one 300-level and two 400-level courses may be included on the POS. If a 300-level course is listed on the POS it cannot be an AGRON course.

### Agricultural Meteorology

Students with a major in Agricultural Meteorology must include AGRON 698 in their POS. Students are encouraged to include the following courses: AGRON 505; MTEOR 605; a modeling course such as AGRON 518, AGRON 525, GEOL 516, or MTEOR 552; and a course in statistics.

### Crop Production and Physiology

The Graduate Major in Crop Production and Physiology has defined five Core Areas.

Core Area 1 (molecular biology / biochemistry): BBMB 404, BBMB 405, BBMB 542A, BBMB 542B, BBMB 542C, BBMB 542D, BBMB 542E, BBMB 542F, BBMB 542G, and PLBIO 545.

Core Area 2 (growth and development): AGRON 525, AGRON 551, BIOL 454, BIOL 428, and GDCB 528.

Core Area 3 (plant physiology and metabolism): AGRON 508, AGRON 516, AGRON 519, AGRON 538, AGRON 553, AGRON 556, and PLBIO 513.

Core Area 4 (crop ecology and management): AGRON 509, AGRON 515, AGRON 530, AGRON 553, AGRON 556, AGRON 584, BIOL 485, BIOL 474, EEOB 584, EEOB 589, HORT 524, PL P 577, and PL P 594.

Core Area 5 (statistics / quantitative methods): AGRON 525, AGRON 526, STAT 587, STAT 505, STAT 512, STAT 588, C R P 551, and NREM 546.

To major in Crop Production and Physiology, at least one course from three of the Core Areas must be included in the POS for the MS. For the PhD, at least one course from each of the Core Areas must be included. A single course cannot be used for more than one Core Area. Students are also encouraged to consider AGRON 698.

### Plant Breeding

The Graduate Major in Plant Breeding has both a resident and distance-education MS program. The following courses are recommended for students with a major in Plant Breeding: AGRON 521, AGRON 522, AGRON 523, AGRON 524, AGRON 528, AGRON 561, AGRON 600A, AGRON 698, STAT 587, and STAT 471. For the distance program, the following courses are recommended: AGRON 501, AGRON 506, AGRON 513, AGRON 520, AGRON 521, AGRON 523, AGRON 524, AGRON 528, AGRON 544, and AGRON 599. Resident students pursuing the PhD also often include AGRON 621 and AGRON 625 in their POS.

### Soil Science

Students pursuing a major in Soil Science may specialize in one of six areas: soil chemistry; soil fertility; soil management; soil microbiology and biochemistry; soil morphology and genesis; or soil physics. If a specialization is chosen, the major professor must be in the designated specialty area. For the PhD, the POS must include one credit of AGRON 600B. Students are also encouraged to consider including AGRON 698 in their POS.

### Master of Science

The general requirements for an MS degree include:

- a minimum of 30 credits from academic courses and research activities;
- at least 22 credits earned at ISU;
- two-thirds or more of earned credits related to the major; and
- completion of a final oral examination.

Both non-thesis and thesis options for an MS degree in Agricultural Meteorology, Crop Production and Physiology, Plant Breeding, and Soil Science are available. Students in the Agronomy major must choose the non-thesis option.

Students in Agricultural Meteorology working towards the MS must meet with their POS Committee at least twice. Besides the final oral examination, an additional meeting must be held near the beginning of the graduate program. At this meeting the student will introduce the area of research to be pursued, potential research questions and methods, and a proposed POS. The student must also present a short written report on how the proposed research will help them master established Enduring Understandings in Agricultural Meteorology.

### Creative Component

If the non-thesis MS degree is chosen, then the student must:

1. register for at least two credits of AGRON 599 that will be used to complete a creative component; and
2. pass a comprehensive final oral examination.

The creative component is work that presents substantial evidence of individual accomplishment. The POS Committee and the student will specify the creative component, how it will be documented, and



how it will be evaluated. The POS Committee also has flexibility in determining the format of the final oral examination. For Agricultural Meteorology, the final oral exam must include an evaluation of the student's mastery of the Enduring Understandings in Agricultural Meteorology.

### **Thesis**

In the thesis option the student must:

1. pursue a research project culminating in a written thesis; and
2. pass a comprehensive final oral examination.

A minimum of three research credits of AGRON 699 must be listed on the POS to account for work on an MS thesis. The thesis is submitted to the POS Committee prior to the final oral examination. During the final oral examination, the student will present and defend the thesis in the presence of the POS Committee. Students in Agricultural Meteorology must also demonstrate mastery of the Enduring Understandings in Agricultural Meteorology. The presentation (also called the "exit seminar") is open to the general public. Only POS Committee members may attend the examination that follows the presentation.

### **Doctor of Philosophy**

The general requirements for a PhD degree include:

- a minimum of 72 credits from academic courses and research activities;
- at least 36 of these credits earned at ISU;
- completion of a preliminary oral examination;
- a written PhD dissertation; and
- completion of a comprehensive final oral examination.

The 72 credits can include the credits earned in pursuit of an MS degree. If an MS was earned at another institution, those courses earned at the other institution can be listed along with the ISU courses, but only if the POS Committee determines that the courses are appropriate. Students in Agricultural Meteorology working towards the PhD must meet with their POS Committee at least three times. Besides the final oral examination and another for the preliminary exam, an additional meeting must be held near the beginning of the graduate program. At this meeting the student will introduce the area of research to be pursued, potential research questions and methods, and a proposed POS. If a student will pursue a PhD without first completing an MS, then during the first meeting of the POS Committee the student must also present a short written report that illustrates connections between the Enduring Understandings in Agricultural Meteorology and their planned research.

### **Qualification Exam**

#### **Agricultural Meteorology**

Students in Agricultural Meteorology must take and pass a qualification exam once they have decided to pursue a PhD. The qualification exam must be passed before taking the preliminary exam. The format

of the qualification exam is as follows. The student will produce a written report that demonstrates their knowledge of the Enduring Understandings in Agricultural Meteorology. If the student has come from another university the report must present research completed at ISU and not at the previous institution (such as a thesis). This report will be submitted to all of the faculty in the major. The student will then make an oral presentation to faculty and other students in the major that summarizes and defends the written report. After the oral presentation, the faculty will meet to determine whether or not the student passed the exam, and whether the student can re-take the exam if the student failed. The faculty will provide written feedback to the student, suggesting areas where improvement is needed and a course of action. The qualification exam can be taken only two times during a student's graduate career at ISU. If a student who had entered the PhD program without an MS degree takes the qualification exam and fails the exam, the student can: take the qualification exam again, if so allowed by the faculty; or continue their graduate career in pursuit of an MS degree. In the latter case, the student could take the qualification exam one more time after an MS degree has been completed.

#### **All Other Majors**

A qualification exam is not required for students in the Crop Production and Physiology, Plant Breeding, or Soil Science majors.

### **Preliminary Exam**

All students pursuing a PhD must take and pass a preliminary oral examination.

#### **Agricultural Meteorology**

For students in Agricultural Meteorology the preliminary exam consists of a defense of the student's proposed dissertation research to the POS Committee. Besides an oral defense, the student must also submit a written report on their proposed research. If the student fails the preliminary exam, the POS Committee must also decide if the student can re-take the exam. The preliminary exam can only be taken twice.

#### **Crop Production and Physiology**

Students in Crop Production and Physiology may be asked to take a written preliminary examination. If a student fails the written preliminary examination, the POS Committee may require the student to retake the exam, to answer additional written questions, or proceed with the oral examination. The nature of the preliminary oral exam is determined by the student's POS Committee.

#### **Plant Breeding**

Students in Plant Breeding must pass a uniform written preliminary examination that consists of five questions, each from one of five topical areas. Faculty members in Plant Breeding evaluate each answer. Evaluators assign a pass or fail grade to the answer. If an evaluator assigns a failing grade to a question, the evaluator shall clearly indicate the strengths and weaknesses of the answer and provide written



information (e.g., references, rationale) to the student which clearly outlines an acceptable response to the question. Failure to provide such written information may invalidate that grade and be considered sufficient cause to exclude the grade in the overall evaluation of the student’s answer. Students who receive two pass grades for a question will have successfully completed that topic, and students must pass each topic to pass the exam. If two valid grades are not in agreement (e.g., one passing grade and one failing grade), additional faculty members will evaluate the answer until there are two valid assessments that are in agreement. Students who do not pass a topic have the opportunity to repeat that topic on the next regularly scheduled exam date. The number of attempts for each topic has not been specified. The examination is offered the last Thursday and Friday of each January and September when one or more students have signed up to take the exam. Students may choose to attempt questions for all five topics, or for subsets of the topics. If a student decides to attempt questions for only certain topics, the student must specify which topics in writing at least one month prior to the scheduled exam date. The nature of the preliminary oral exam is determined by the student’s POS Committee.

**Soil Science**

Students in Soil Science must pass a written preliminary examination. Exam questions are authored by members of the POS Committee. The format of each question is left open and they may be formulated as open– or closed–book problems. A reasonable period for completion may be set by the author of the question. The student’s responses are formally scored or ranked only by the POS Committee member who authored the question. A copy of the student’s responses to all questions is submitted to all POS Committee members at least one week before the student’s preliminary oral examination. When the student submits a request to schedule the preliminary oral examination, the student’s major professor certifies by signing the form that the student has satisfactorily completed a written preliminary exam. The nature of the preliminary oral exam is determined by the student’s POS Committee.

**Doctoral Dissertation and Final Oral Examination**

All students must include at least three AGRON 699 credits in their POS for work on their PhD dissertation. During the required final oral examination, a student presents and defends the dissertation. This presentation (also called the “exit seminar”) is open to the general public. Only POS Committee members may attend the examination that follows the presentation.

**GRADUATE CERTIFICATE IN AGRONOMY FOR DISTANCE STUDENTS**

The Graduate Certificate in Agronomy is for distance students and is comprised of the first six courses in the MS in Agronomy curriculum. All six courses are required for certificate completion.

AGRON 501	Crop Growth and Development	3
AGRON 502	Chemistry, Physics, and Biology of Soils	3
AGRON 503	Climate and Crop Growth	3
AGRON 511	Crop Improvement	3
AGRON 512	Soil-Plant Environment	3
AGRON 514	Integrated Pest Management	3
<b>Total Credits</b>		<b>18</b>

**GRADUATE MINOR**

On-campus students who wish to minor in Agronomy must include a core course from each of the other four graduate majors in their POS. These courses are:

AGRON 505	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 516	Crop Physiology	3
AGRON 521	Principles of Cultivar Development	3
AGRON 553	Soil-Plant Relationships	3

However, one substitution is allowed with the approval of the faculty member serving as the minor representative on the POS Committee.

**Animal Ecology**

Administered by the Department of Natural Resource Ecology and Management

The Animal Ecology curriculum provides its majors with an understanding of ecological principles and processes and their applications to natural resource management. This major is oriented toward students desiring a general and flexible program in environmental biology and for those planning graduate study. Graduates find employment as aquaculturists, aquatic ecologists, wildlife biologists, fisheries biologists, resource managers, and ecologists for industry, environmental consulting firms, natural resource and environmental agencies and organizations, zoos, and as educators. Graduates are able to communicate and work effectively in the multidisciplinary arena of ecology and natural resource management. Additionally, they recognize the importance of ethics in their field of study and are sensitive to cultural diversity and broad environmental concerns.

Students majoring in Animal Ecology may select from one or more of four options: Fisheries and Aquatic Sciences, Interpretation of Natural Resources, Preveterinary and Wildlife Care, or Wildlife. Each option has specific outcomes expectations that include (1) the scope of the specialization and its relationships to broader aspects of animal ecology, biotic resource management, and other allied scientific disciplines and professions, (2) career opportunities and requirements, and (3) knowledge and skills appropriate for employment at technical and practitioner levels in each discipline.

All options require three months (400 hours) of relevant work experience or study at a biological station prior to graduation. The latter may be accomplished at the university's affiliate field stations: Rod and Connie French Conservation Camp in Montana, Iowa Lakeside Laboratory at West Lake Okoboji, and Gulf Coast Research Laboratory at Ocean Springs, Mississippi. Information on these laboratories is available from the Department of Natural Resource Ecology and Management Student Services Center.

Preveterinary medicine preparation may be achieved while satisfying degree requirements in animal ecology.

Additional education and training can lead to other opportunities in such areas as research and management, natural resources planning and administration, teaching, and environmental consulting, among others. Graduate training is necessary for many specialized positions within the fields of animal ecology. Students preparing for graduate study should consult with their academic advisor concerning appropriate coursework.

Students wishing to be certified by the American Fisheries Society or The Wildlife Society need to consult with their advisors in selecting required courses in their respective programs. The formal application then needs to be completed and submitted for review by their professional societies. Certification in either society has many professional benefits and may be required or recommended for employment by federal and state agencies and private industry.

Students seeking certification to teach biology in secondary schools must meet requirements of the College of Human Sciences as well as those of the Animal Ecology curriculum. In addition, they must apply formally for admission to the teacher education program (see Teacher Education Program). Students with an interest in careers in outdoor writing are encouraged to obtain a minor or a second major in journalism (see Journalism and Communication, Courses and Programs). Students who wish to pursue a job as a conservation officer may wish to minor in criminal justice (see Criminal Justice).

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Identify, explain and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics.

For any given situation, graduates identify, critically evaluate, and state their own beliefs and values as they relate to professional and societal ethical standards, for any given situation. They elaborate on how those values and beliefs impact their actions, and they explain which specific canons or principles of a professional code of ethics are applicable to a particular situation.

2. Anticipate, analyze and evaluate natural resource issues and opportunities, explaining the ecological, economic, and social

consequences of natural resource actions at various scales and over time.

In the case of existing natural resource issues, graduates explain the ecological, economic, and social consequences that reasonably could be expected to occur as the result of actions taken to address the issue. The explanation includes considerations of the geographic area influenced by the issue as well as the time frame over which the consequences can be expected to occur. In the case of evolving circumstances, graduates predict natural resource issues that may arise as a result of the circumstances and explain the ecological, economic and social consequences of those issues.

3. Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

Graduates identify the comprehensive list of individuals or groups who may be impacted by particular natural resource problems and issues. They are well versed in techniques for seeking and incorporating input and perspectives from those people, and they incorporate those inputs and perspectives into the decision-making process.

4. Assess, analyze, synthesize, and evaluate information fairly and objectively.

Not all information is equally sound or applicable in a particular situation. Graduates evaluate the validity and importance of information obtained from any source. Once evaluated, they use the information appropriately in the solution of natural resource problems.

5. Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem-solving approaches.

Effective solution of natural resource problems often involves input from diverse constituencies with diverse value scales. When working individually, graduates incorporate those values into the solution of problems. Graduates work effectively with diverse individuals and groups to reach consensus on problem solutions.

6. Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

The natural resource base with which we deal is capable of providing numerous goods and services to numerous publics. Graduates formulate multiple alternatives, as well as action plans, to achieve stakeholder objectives. They evaluate each of the feasible alternatives in terms of biological possibility, economic feasibility and social acceptability. They recommend best alternatives based on the stakeholders' objectives, and they justify their recommendations on the basis of sound science.

7. Communicate clearly and effectively with all audiences using appropriate oral, visual, electronic, and written techniques.

Graduates utilize the best form, or forms, of communication for effectively conveying information to, or seeking input from, a particular audience. They are proficient in all forms of communication, and adjust their style or technique of communication to suit different audiences.

8. Recognize and interpret resource problems and opportunities across spatial scales from local to global.

Graduates recognize where resource problems and opportunities can or could exist, and they evaluate and interpret these for others. They, evaluate and interpret for individual landowners at a very local scale as well as for problems that span multiple ownerships, regions and ecosystems.

9. Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

Different cultures, population densities, and income classes value and use natural resources in very different ways. Because natural resources often are used simultaneously by different groups, it is important for graduates to be able to account for those differing uses and valuations when making management decisions about natural resources.

10. Exercise leadership skills as professionals and engaged citizens

Graduates organize, facilitate, and participate effectively in groups, teams, or organizations. They define problems or opportunities, implement action planning processes, work toward goals and justify actions taken.

11. Demonstrate creativity and innovation in identifying and pursuing opportunities that produce environmental, social, or economic value.

Graduates display creativity in a variety of situations, and identify opportunities to promote understanding of natural resource issues. They demonstrate persistence when working with individuals who have diverse interests in order to build consensus and facilitate accomplishing stated objectives.

12. Exercise life-long learning skills developed before graduation.

Graduates articulate why life-long learning is important. Graduates find answers to their questions as they arise throughout life. They are capable of determining what they need to know to effectively deal with an issue or situation, and they know how to obtain the necessary knowledge. They have learned how to learn in the absence of teachers.

## CURRICULUM IN ANIMAL ECOLOGY

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

#### International Perspective: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communications Proficiency (with grade of C or better):

6 cr. of English composition

3 cr. of speech fundamentals

#### Communication/Library 16 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
LIB 160	Introduction to College Level Research	1
Plus 6 credits from the following:		6
ENGL 207	Introduction to Creative Writing	
ENGL 275	Analysis of Popular Culture Texts	
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 304	Creative Writing: Fiction	
ENGL 305	Creative Writing: Nonfiction	
ENGL 306	Creative Writing: Poetry	
ENGL 309	Proposal and Report Writing	
ENGL 310	Rhetorical Analysis	
ENGL 312	Communicating Science and Public Engagement	
ENGL 314	Technical Communication	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
P R 305	Publicity Methods	
NREM 330	Principles of Interpretation	
SP CM 312	Business and Professional Speaking	

#### Humanities and Social Sciences: 6 cr.

Humanities course list: <https://www.cals.iastate.edu/student-services/humanities/>

Social Science course list: <https://www.cals.iastate.edu/student-services/social-sciences/>

Approved humanities course	3
Approved social science course	3

**Total Credits** **6**

**Ethics: 3 cr.**

3 cr. from approved ethics list: <https://www.cals.iastate.edu/student-services/ethics> (<https://www.cals.iastate.edu/student-services/ethics/>)

**Mathematical Sciences: 6 cr.**

MATH 140	College Algebra	3
STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	

**Total Credits** 6-7

**Physical Sciences: 14 cr.**

CHEM 163	College Chemistry	5
& 163L	and Laboratory in College Chemistry	
or CHEM 177	General Chemistry I	
& 177L	and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	4
& 231L	and Laboratory in Elementary Organic Chemistry	
or CHEM 331	Organic Chemistry I	
& 331L	and Laboratory in Organic Chemistry I	
PHYS 115	Physics for the Life Sciences	5
& 115L	and Laboratory in Physics for the Life Sciences	
or PHYS 131	General Physics I	
& 131L	and General Physics I Laboratory	

**Total Credits** 14

**Biological Sciences: 24 cr.**

NREM 110	Orientation in Natural Resource Ecology and Management	1
NREM 120	Introduction to Renewable Resources	3
NREM 211	Careers in Natural Resources	1
A ECL 231	Principles of Wildlife & Fisheries Conservation	3
A ECL 312	Ecology	4
A ECL 365	Vertebrate Biology	4
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1

**Total Credits** 24

**Practical Experience:****FISHERIES AND AQUATIC SCIENCES OPTION**

A ECL 321	Fish Biology	3
A ECL 486	Aquatic Ecology	3
A ECL 486L	Aquatic Ecology Laboratory	1
Choose one of two Mathematics sequences:		7-8

Sequence 1 (Calculus)

MATH 143	Preparation for Calculus	
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One of the following:

MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Sequence 2 (Statistics)		
NREM 240	Quantitative Problem Solving in Natural Resources	
or MATH 143	Preparation for Calculus	
STAT 301	Intermediate Statistical Concepts and Methods	
Plus 20 credits from approved list		20

**Total Credits** 34-35

**INTERPRETATION OF NATURAL RESOURCES OPTION**

A ECL 366	Natural History of Iowa Vertebrates	3
BIOL 366	Plant Systematics	4
ENT 370	Insect Biology	3
NREM 303	Internship	1-3
NREM 330	Principles of Interpretation	3
BIOL 474	Plant Ecology	3
or FOR 356	Dendrology	

One of the following: 3

AGRON 182	Introduction to Soil Science	
AGRON 206	Introduction to Weather and Climate	
ASTRO 120	The Sky and the Solar System	
GEOL 100	How the Earth Works	
GEOL 101	Environmental Geology: Earth in Crisis	
GEOL 108	Introduction to Oceanography	

Plus additional credits from approved list to total 33 credit hours. 10-13

**Total credits** 33

**PREVETERINARY & WILDLIFE CARE OPTION**

AN S 214	Domestic Animal Physiology	3
or B M S 329	Anatomy and Physiology of Domestic Animals	

One of the following: 3

A ECL 551	Behavioral Ecology	
AN S 336	Domestic Animal Behavior and Well-Being	
ANTHR 317	Primate Behavior, Ecology, and Evolution	
BIOL 354	Animal Behavior	

Three credits from the following: 3

A ECL 321	Fish Biology	
A ECL 366	Natural History of Iowa Vertebrates	
A ECL 457	Herpetology	
A ECL 457L	Herpetology Laboratory	
A ECL 458	Ornithology	
A ECL 458L	Ornithology Laboratory	
A ECL 459	Mammalogy	

A ECL 459L	Mammalogy Laboratory	
One of the following:		3-5
AN S 214	Domestic Animal Physiology	
B M S 329	Anatomy and Physiology of Domestic Animals	
BIOL 335	Principles of Human and Other Animal Physiology	
BIOL 351	Comparative Chordate Anatomy	
BIOL 352	Vertebrate Histology	
BIOL 434	Endocrinology	
One of the following:		3
AN S 331	Domestic Animal Reproduction	
BIOL 313	Principles of Genetics	
BIOL 423	Developmental Biology	
GEN 320	Genetics, Agriculture and Biotechnology	
NREM 315	Genetics for Natural Resource Managers.	
At least three credits from the following list:		3-4
A ECL 401	Intro to Aquatic Animal Medicine	
A ECL 442	Aquaculture	
A ECL 454	Principles of Wildlife Disease	
AN S 319	Animal Nutrition	
AN S 493	Workshop in Animal Science	
BIOL 353	Introductory Parasitology	
MICRO 201	Introduction to Microbiology	
MICRO 201L	Introductory Microbiology Laboratory	
3 cr from course level 300-500 from A ECL or NREM		3
Plus additional credits from approved list to total 33 credit hours.		9-12
Total credits		33

**WILDLIFE OPTION**

A ECL 371	Ecological Methods	3
A ECL 451	Wildlife Ecology and Management	3
BIOL 313	Principles of Genetics	3
or GEN 320	Genetics, Agriculture and Biotechnology	
or NREM 315	Genetics for Natural Resource Managers.	
BIOL 366	Plant Systematics	4
Choose one of two Mathematics sequences		7-8
Sequence 1 (Calculus)		
MATH 143	Preparation for Calculus	
One of the following:		
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Sequence 2 (Statistics)		
NREM 240	Quantitative Problem Solving in Natural Resources	
or MATH 143	Preparation for Calculus	

STAT 301	Intermediate Statistical Concepts and Methods	
Six credits from the following list:		6
A ECL 457	Herpetology	
A ECL 457L	Herpetology Laboratory	
A ECL 458	Ornithology	
A ECL 458L	Ornithology Laboratory	
A ECL 459	Mammalogy	
A ECL 459L	Mammalogy Laboratory	
Six credits from the following list:		6
A ECL 455	International Wildlife Issues	
ENV S 283	Introduction to Environmental Politics and Policies	
ENV S 293	Environmental Planning	
NREM 270	Foundations in Natural Resource Policy and History	
NREM 385	Natural Resource Policy	
NREM 452	Ecosystem Management	
NREM 460	Controversies in Natural Resource Management	
AM IN 313	Native Land, Water, and Resources	
At least three credits from the following list:		3-4
A ECL 415	Ecology of Freshwater Invertebrates, Plants, and Algae	
A ECL 454	Principles of Wildlife Disease	
A ECL 516	Avian Ecology	
A ECL 551	Behavioral Ecology	
ANTHR 317	Primate Behavior, Ecology, and Evolution	
BIOL 315	Biological Evolution	
BIOL 336	Ecological and Evolutionary Animal Physiology	
BIOL 354	Animal Behavior	
BIOL 354L	Laboratory in Animal Behavior	
BIOL 471	Introductory Conservation Biology	
EEOB 507	Advanced Animal Behavior	
ENT 370	Insect Biology	
At least five credits from the following list:		5
A ECL 415	Ecology of Freshwater Invertebrates, Plants, and Algae	
AGRON 317	Principles of Weed Science	
BIOL 355	Plants and People	
BIOL 454	Plant Anatomy	
BIOL 456	Principles of Mycology	
BIOL 474	Plant Ecology	
EEOB 564	Wetland Ecology	
FOR 356	Dendrology	

FOR 358	Forest Herbaceous Layer: Ecology and Identification.	
NREM 357	Midwestern Prairie Plants	
Plus additional credits from approved list to total 45 credit hours.		0-5
Total credits		45

## Animal Ecology, B.S. - fisheries and aquatic sciences

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
MATH 140	3 ENGL 150	3
CHEM 163	4 LIB 160	1
CHEM 163L	1 STAT 101 or 104	3-4
Required Elective	3	
<b>16</b>		<b>14-15</b>

### Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 A ECL 231	3
NREM 211	1 CHEM 231	3
A ECL 312	4 CHEM 231L	1
MATH Calculus Elective	4 SP CM 212	3
ENGL 250	3 Free Elective / Restricted Elective	3
	Required Elective	3
<b>16</b>		<b>16</b>

### Junior

Fall	Credits Spring	Credits
PHYS 115	4 A ECL 321	3
PHYS 115L	1 Communications Elective	3
A ECL 486	3 Restricted Elective	3
A ECL 486L	1 Required Elective	3
Restricted Elective	6 Free Elective	3
Required Elective	3	
<b>18</b>		<b>15</b>

### Senior

Fall	Credits Spring	Credits
Required Elective	3 Restricted Electives	7
Restricted Elective	6 Communications Elective	3
Free Electives	8 Free Electives	6
<b>17</b>		<b>16</b>

- \* To complete degree program in 4 years students must maintain an average of 16 credits per semester.
- \*\* Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.
- \*\*\* In scheduling coursework, students should pay particular attention to courses with limited offerings (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).

## Animal Ecology, B.S. - interpretation of natural resources option

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
Required Elective	3 ENGL 150	3
MATH 140**	3 STAT 101 or 104	3-4
CHEM 163	4 LIB 160	1
CHEM 163L	1	
<b>16</b>		<b>14-15</b>

### Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231	3
NREM 211	1 CHEM 231L	1
A ECL 312	4 SP CM 212	3
Earth Science Elective	3 Free Elective/ Restricted Elective	3
ENGL 250	3 Required Elective	3
	A ECL 231	3
<b>15</b>		<b>16</b>

### Junior

Fall	Credits Spring	Credits
PHYS 115	4 NREM 330	3
PHYS 115L	1 Communications Elective	3
Botany or Restricted Elective	3-4 A ECL 366	3
ENT 370	3 Required Elective	3
Required Elective	3 BIOL 366	4
Free Elective	3	
<b>17-18</b>		<b>16</b>



<b>Senior</b>			Restricted Elective	3 Natural History Elective	3
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>	Required Elective	3 Required Elective	3
Restricted Elective	6-7 Botany or Restricted Elective	3	Free Elective	6 Free Elective	6
Required Elective	3 Restricted Elective	3		<b>17</b>	<b>18</b>
Free Electives	7 Communications Elective	3	<b>Senior</b>		
	NREM 303	1-3	<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
	Free Electives (if needed)	8	Restricted Elective	6 Restricted Elective	3
	<b>16-17</b>	<b>18-20</b>	Genetics/Development Elective	3 Communications Elective	3
			Required Elective	3 Free Elective	9
			Communications Elective	3	
			Free Elective	2	
				<b>17</b>	<b>15</b>
* To complete degree program in 4 years students must maintain an average of 16 credits per semester.			* To complete degree program in 4 years students must maintain an average of 16 credits per semester.		
** Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.			** In scheduling coursework, students should pay attention to courses with limited offerings, (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).		
*** In scheduling coursework, students should pay particular attention to courses with limited offerings (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).			# Admission to the ISU College of Veterinary Medicine requires a different set of Chemistry and Physics courses. Students should plan to enroll in Chemistry 177, 177L, 178, 331, 331L and 332. The Physics requirement is PHYS 131 and 131L.		

## Animal Ecology, B.S. - Pre-vet & wildlife care option

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
Required Elective	3 ENGL 150	3
MATH 140	3 STAT 101 or 104	3-4
CHEM 163 <sup>#</sup>	4 LIB 160	1
CHEM 163L <sup>#</sup>	1	
	<b>16</b>	<b>14-15</b>

### Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231 <sup>#</sup>	3
NREM 211	1 CHEM 231L <sup>#</sup>	1
A ECL 312	4 SP CM 212	3
Restricted Elective	3 Free Elective/ Restricted Elective	3
ENGL 250	3 Required Elective	3
	A ECL 231	3
	<b>15</b>	<b>16</b>

### Junior

Fall	Credits Spring	Credits
PHYS 115	4 NREM 330	3
PHYS 115L	1 AN S 214 or B M S 329	3

## Animal Ecology, B.S. - wildlife option

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
NREM 110	1 NREM 120	3
MATH 140	3 ENGL 150	3
CHEM 163	4 LIB 160	1
CHEM 163L	1 STAT 101 or 104	3-4
Required Elective	3	
	<b>16</b>	<b>14-15</b>

### Sophomore

Fall	Credits Spring	Credits
A ECL 365	4 CHEM 231	3
NREM 211	1 CHEM 231L	1
A ECL 312	4 SP CM 212	3
MATH Calculus Elective	4 Free Elective / Restricted Elective	3
ENGL 250	3 Required Elective	3

	A ECL 231	3
	<b>16</b>	<b>16</b>
<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
PHYS 115	4 BIOL 366	4
PHYS 115L	1 Communications Elective	3
A ECL 371	3 Restricted Electives	6
Restricted Electives	6 Required Elective	3
Required Elective	3	
	<b>17</b>	<b>16</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A ECL 451	3 Restricted Electives	9
Restricted Electives	6 Communications Elective	3
Required Elective	3 Free Elective	3
Free Electives	6	
	<b>18</b>	<b>15</b>

- \* To complete degree program in four years students must maintain an average of 16 credits per semester.
- \*\* Initial math course is determined on the basis of high school math and placement test scores. A non-credit course (Math 10) maybe be required at additional costs.
- \*\*\* In scheduling coursework, students should pay attention to courses with limited offerings, (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course). It is critical that students take A ECL 371 fall semester of the junior year and A ECL 451 fall semester of the senior year.

## Minor - Animal Ecology

The department offers a minor in animal ecology that may be earned by taking 15 credits in the department including:

A ECL 312	Ecology	4
A ECL 365	Vertebrate Biology	4
NREM 120	Introduction to Renewable Resources	3

Plus four additional credits of Animal Ecology or NREM courses at the 300 level or above.

The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Animal Science

The Department of Animal Science Undergraduate Program intends for its graduates to be able to explain the symbiotic relationship of animals

and humans, to contribute to the solution of complex problems of animal enterprise management, and to apply their knowledge and skills in a technically demanding global community. Graduates of our program will be knowledgeable about sustainable animal production practices that also ensure animal health and well-being and stewardship of natural resources.

To enable learners to pursue a wide array of career interests, the department offers learning experiences ranging from the basic to the applied sciences. Learner outcomes for these goals, for each of our courses, and other information defining the program can be found at our web site: <https://www.ans.iastate.edu/undergraduate-students> (<https://www.ans.iastate.edu/undergraduate-students/>). Our program is designed to provide career skills appropriate to job market needs. Our faculty goals include providing superior academic advising to enable students to fulfill their objectives.

## Student Learning Outcomes

Learning outcomes for the Animal and Dairy Science majors dictate that, upon completion of the program, graduates will be able to:

- Apply scientifically based practices for the care, management, and study of managed animals and animal products.
- Communicate in oral and written formats.
- Describe the contemporary domestic and global issues impacting animal science
- Contribute or lead team efforts to achieve group goals.
- Utilize effective life-long learning skills.
- Evaluate the impacts of animal management practices on economic, sociological, and environmental sustainability.

The department offers the degrees bachelor of science in animal science and bachelor of science in dairy science. A double major in animal and dairy science is not permitted. However, combining either the animal science or dairy science majors with other curricula is permitted. A limit of 6 credits each in Intercollegiate Judging (Animal Science 475), or any independent study course (490 courses) can be applied toward a degree. A limit of 4 credits of Undergraduate Teaching Experience (Animal Science 497) can be applied toward a degree.

The department offers a minor in Animal Science and a minor in Meat Science. Certificates in Beef Cattle Production Management, Dairy Cattle Management, Swine Production Management, Poultry Production Management, and Equine Science and Management are also offered. Both the animal science curricula and dairy science curricula allow complementary work toward admission to veterinary medical school and other professional schools, which may be done while satisfying requirements for the bachelor of science degree. A program that combines bachelor of science and master of science in animal science is offered. In addition, a program that combines a

bachelor of science and master of business administration is offered. The Department facilitates student participation in the Midwest Poultry Consortium and the Swine Science Online program to offer additional training in poultry and swine production, respectively.

Curriculum in Animal Science

Students majoring in animal science will complete the degree requirements listed below. If desired, a student may also choose a specialized option. To earn a degree in Animal Science from Iowa State University a minimum of 15 credits in Animal Science must be earned from courses taught in the Animal Science department at ISU. A minimum of 15 credits of animal science coursework must be earned at Iowa State University.

Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

International Perspectives

Approved International Perspectives course 3

U.S. Diversity

Approved U. S. Diversity course 3

Communications Proficiency (with a C or better)

English composition 6

Speech fundamentals 3

Total Credits 9

Communication/Library

ENGL 150 Critical Thinking and Communication 3

ENGL 250 Written, Oral, Visual, and Electronic Composition 3

LIB 160 Introduction to College Level Research 1

One course from the following: 3

SP CM 212 Fundamentals of Public Speaking

AGEDS 311 Presentation and Sales Strategies for Agricultural Audiences

AGEDS 327 Survey of Agriculture and Life Sciences Communication

COMST 214 Professional Communication

One course from the following: 3

ENGL 302 Business Communication

ENGL 309 Proposal and Report Writing

ENGL 312 Communicating Science and Public Engagement

ENGL 314 Technical Communication

Total Credits 13

Humanities and Social Sciences

Approved Humanities course 3

Approved Social Science course 3

Total Credits 6

Ethics

Approved Ethics course 3

Mathematical Sciences

One course from the following: 3-4

MATH 140 College Algebra

MATH 150 Discrete Mathematics for Business and Social Sciences

MATH 160 Survey of Calculus

MATH 165 Calculus I

One course from the following: 3-4

STAT 101 Principles of Statistics

STAT 104 Introduction to Statistics

STAT 226 Introduction to Business Statistics I

Total Credits 6-8

Physical Sciences

A minimum of 8 credits are required. These requirements are specific to option and are listed with each option below.

Biological Sciences

BIOL 211 Principles of Biology I 3

BIOL 211L Principles of Biology Laboratory I 1

BIOL 212 Principles of Biology II 3

BIOL 212L Principles of Biology Laboratory II 1

BIOL 313 Principles of Genetics 3

or GEN 320 Genetics, Agriculture and Biotechnology

MICRO 201 Introduction to Microbiology and Introductory Microbiology Laboratory 3-4

or MICRO 302 Biology of Microorganisms and Microbiology Laboratory & 302L

Total Credits 14-15

Business

One course from the following: 3

ACCT 284 Financial Accounting

ECON 101 Principles of Microeconomics

ECON 102 Principles of Macroeconomics

Total Credits 3

**Animal Science Core**

AN S 101	Working with Animals	2
AN S 110	Orientation in Animal Science and ISU	1
AN S 114	Survey of the Animal Industry	2
AN S 210	Career Preparation in Animal Science	1
AN S 211	Issues Facing Animal Science	1
AN S 214	Domestic Animal Physiology	3
AN S 214L	Domestic Animal Anatomy and Physiology Lab	1
AN S 319	Animal Nutrition	3
AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3
AN S 411	Addressing Issues in Animal Science	1

**Total Credits** 24

**General Animal Science**

CHEM 163	College Chemistry	5
& 163L	and Laboratory in College Chemistry	
or CHEM 177	General Chemistry I	
& 177L	and Laboratory in General Chemistry I	

CHEM 331	Organic Chemistry I	3
or BBMB 221	Structure and Reactions in Biochemical Processes	

Three courses from the following: 9

AN S 216	Equine Science	
AN S 223	Poultry Science	
AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 228	Laboratory Animal Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270	Foods of Animal Origin	
& 270L	and Foods of Animal Origin Laboratory	

One course from the following: 2-4

AN S 313	Exercise Physiology of Animals	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 352	Vertebrate Histology	
BIOL 353	Introductory Parasitology	
ENT 372	Livestock Entomology	

ENT 374	Insects and Our Health	
MICRO 310	Medical Microbiology	
VDPAM 487	Livestock Disease Prevention	
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management	
AGRON 334	Forage Crop Management	

One course from the following: 3

AN S 415	Equine Systems Management	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	

One course from the following: 2-3

AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	
FS HN 410	Food Analysis	
FS HN 420	Food Microbiology	
MICRO 407	Microbiological Safety of Foods of Animal Origins	

**Total Credits** 24-27

Additional free electives required for Animal Science 23-29

**Pre-Veterinary Medicine Option**

BBMB 301	Survey of Biochemistry	3
or BBMB 316	Principles of Biochemistry	
or BBMB 404	Biochemistry I	
or BBMB 420	Mammalian Biochemistry	

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
PHYS 131	General Physics I	5
& 131L	and General Physics I Laboratory	

Three courses from the following: 9

AN S 216	Equine Science	
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AN S 223	Poultry Science	
AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 228	Laboratory Animal Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	
One course from the following:		2-4
AN S 313	Exercise Physiology of Animals	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 352	Vertebrate Histology	
BIOL 353	Introductory Parasitology	
ENT 372	Livestock Entomology	
ENT 374	Insects and Our Health	
MICRO 310	Medical Microbiology	
VDPAM 487	Livestock Disease Prevention	
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management	
AGRON 334	Forage Crop Management	
One course from the following:		3
AN S 415	Equine Systems Management	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
One course from the following:		2-3
AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 434	Dairy Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	

FS HN 410	Food Analysis
FS HN 420	Food Microbiology
MICRO 407	Microbiological Safety of Foods of Animal Origins

**Total Credits** **36-39**

Additional free electives required for the Pre-veterinary Medicine Option 8-14

\* The Iowa State University College of Veterinary Medicine academic requirements are met by completion of this option (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements> (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements/>)).

### Animal Science, B.S. - GENERAL

#### Freshman

Fall	Credits Spring	Credits
AN S 110	1 AN S 114	2
AN S 101	2 CHEM 177 or 163	4
BIOL 211	3 CHEM 177L or 163L	1
BIOL 211L	1 Humanities - elective list	3
ENGL 150	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4	
Soc. Sci. - elective list	3	
<b>17-18</b>		<b>16-17</b>

#### Sophomore

Fall	Credits Spring	Credits
AN S 211	1 AN S 210	1
AN S 200 - elective list	3 AN S 214	3
AN S 200 - elective list	3 AN S 214L	1
BIOL 212	3 AN S 200 - elective list	3
BIOL 212L	1 ENGL 250	3
BBMB 221	3 MICRO 201 or 302	2-3
ECON 101, 102, or ACCT 284	3 MICRO 201L or 302L	1
	Free elective	3
<b>17</b>		<b>17-18</b>

#### Junior

Fall	Credits Spring	Credits
AN S 319	3 AN S 320	3
AN S 331	3 AN S 352	3
GEN 320 or BIOL 313	3 AN S 300 - elective list	3
U.S. Diversity - elective list	3 Ethics -elective list	3

Free elective	3 Free elective	3
	<b>15</b>	<b>15</b>

**Senior**

Fall	Credits Spring	Credits
AN S 411	1 AN S 400 - Option 2	3
AN S 400 - Option 1	3 International Perspective - elective list	3
ENGL 302, 309, 312, or 314	3 Free elective	3
Free elective	3 Free elective	3
Free elective	3 Free elective	4
Free elective	3	
	<b>16</b>	<b>16</b>

Important Note This is only one of many equally-sound schedule sequences.

Free electives and specified group electives are often chosen to complement the student's career focus. The student's academic advisor assists with developing scheduling schemes that prepare students individually for careers in the animal industry. They are explained fully in AN S 110 and through appointments with the student's advisor.

**Animal Science, B.S. - pre-veterinary medicine****Freshman**

Fall	Credits Spring	Credits
AN S 110	1 AN S 114	2
AN S 101	2 CHEM 177	4
BIOL 211	3 CHEM 177L	1
BIOL 211L	1 Humanities - elective list	3
ENGL 150	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4	
Soc. Sci. - elective list	3	
	<b>17-18</b>	<b>16-17</b>

**Sophomore**

Fall	Credits Spring	Credits
AN S 211	1 AN S 214	3
AN S 200 - elective list	3 AN S 214L	1
AN S 200 - elective list	3 AN S 200 - elective list	3
BIOL 212	3 CHEM 331	3
BIOL 212L	1 CHEM 331L	1
CHEM 178	3 ENGL 250	3

ECON 101, 102, or ACCT 284	3 Ethics - elective list	3
	<b>17</b>	<b>17</b>

**Junior**

Fall	Credits Spring	Credits
AN S 210	1 AN S 320	3
AN S 319	3 AN S 352	3
AN S 331	3 AN S 300 - elective list	3
GEN 320 or BIOL 313	3 BBMB 301, 316, 404, or 420	3
CHEM 332	3 US Diversity - elective list	3
MICRO 201 or 302	2-3	
MICRO 201L or 302L	1	
	<b>16-17</b>	<b>15</b>

**Senior**

Fall	Credits Spring	Credits
AN S 411	1 AN S 400 - Option 2	3
AN S 400 - Option 1	3 International Perspective - elective list	3
ENGL 302, 309, 312, or 314	3 Free elective	3
PHYS 131	4 Free elective	3
PHYS 131L	1 Free elective	3
Free elective	3	
Free elective	2	
	<b>17</b>	<b>15</b>

Important Note This is only one of many equally-sound schedule sequences.

\* Credits currently required for application to Veterinary Medicine program at ISU (55 credits)

- General Chemistry with lab (7)
- Organic Chemistry with lab (4)
- Biochemistry (3)
- General Physics with lab (4)
- General Biology with lab (8)
- Genetics/Animal Breeding (3)
- Mammalian Anatomy and/or Physiology (3)
- English Composition (6)
- Oral Communication (3)
- Humanities and/or Social Sciences (6)
- Other Electives (8)

**Minors: Animal Science and Meat Science**

All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.



The department offers a minor in Animal Science. The minor requires:

AN S 101	Working with Animals	2
AN S 114	Survey of the Animal Industry	2
AN S 214	Domestic Animal Physiology	3
AN S 214L	Domestic Animal Anatomy and Physiology Lab	1
One course from the following:		3
AN S 216	Equine Science	
AN S 223	Poultry Science	
AN S 224	Companion Animal Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	
AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	
One course from the following:		3
AN S 313	Exercise Physiology of Animals	
AN S 319	Animal Nutrition	
AN S 331	Domestic Animal Reproduction	
AN S 345	Growth and Development of Domestic Animals	
AN S 352	Genetic Improvement of Domestic Animals	
One course from the following:		2-3
AN S 319	Animal Nutrition	
AN S 320	Animal Feeds and Feeding	
AN S 331	Domestic Animal Reproduction	
AN S 324	Food Processing for Companion Animals	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 337	Lactation	
AN S 345	Growth and Development of Domestic Animals	
AN S 352	Genetic Improvement of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
AN S 419	Advanced Animal Nutrition	
<b>Total Credits</b>		<b>16-17</b>

A total of 9 credits must be earned at Iowa State University in animal science coursework that meets a degree requirement for the B.S. degree in animal science. Students interested in the Animal Science minor should contact an Animal Science advisor.

## Minor - Meat Science

The department offers a minor in Meat Science. The minor requires:

AN S 270	Foods of Animal Origin	2
AN S 270L	Foods of Animal Origin Laboratory	1

AN S 360	Fresh Meat Science and Applied Muscle Biology	3
AN S 460	Science and Technology of Value Added Meat Products	3
One course from the following:		1
AN S 489	Issues in Food Safety	
AN S 490C	Independent Study: Meat Science	
5-6 Credits from the following		5-6
AN S 324	Food Processing for Companion Animals	
FS HN 305	Food Quality Management and Control	
FS HN 311	Food Chemistry	
FS HN 403	Food Laws and Regulations	
FS HN 406	Sensory Evaluation of Food	
FS HN 410	Food Analysis	
FS HN 412	Food Product Development	
FS HN 420	Food Microbiology	
FS HN 471	Food Processing	
MICRO 407	Microbiological Safety of Foods of Animal Origins	
<b>Total Credits</b>		<b>15-16</b>

Students majoring in Animal Science will not be allowed to count the 9 required credits (270, 270L, 360, 460) toward their Animal Science degree. Students interested in the Meat Science minor should contact an Animal Science advisor.

The Department of Animal Science offers certificates in:

- Beef Cattle Production Management
- Dairy Cattle Production Management
- Equine Science and Management
- Poultry Production Management
- Swine Production Management

All certificates require at least 24 credits, including at least 18 credits at the 300 or 400 level. At least 9 credits must be unique to the certificate and will not be applied to a major, minor, or another certificate. All courses applied to the certificate must be taken for a grade. A cumulative GPA of 2.0 is required to complete the program and receive the certificate.

## Beef Cattle Production Management Foundation Course (3 credits)

AN S 226	Beef Cattle Science	3
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## Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

**Expertise Expansion (3 credits)**

AGRON 280	Crop Development, Production and Management	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3

\* Course fulfills the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

**Enterprise Management (3 credits)**

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management ^	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

^ Course is a prerequisite for AN S 426

**Beef Cattle Production Emphasis (6 credits)**

AN S 426	Beef Cattle Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

**Dairy Cattle Production Management Certificate Foundation Course (3 credits)**

AN S 235	Dairy Cattle Science	3
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**Fundamental Disciplines in Animal Science (9 credits)**

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 337	Lactation	3

**Expertise Expansion (3 credits)**

AGRON 280	Crop Development, Production and Management	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 335	Dairy Cattle Evaluation	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 352	Genetic Improvement of Domestic Animals	3

AN S 419	Advanced Animal Nutrition	2
FS HN 407	Microbiological Safety of Foods of Animal Origins	3
MICRO 302	Biology of Microorganisms	3
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management *	3
TSM 455	Feed Processing and Technology *	3
TSM 457	Feed Safety, Ingredient Quality and Analytics *	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

**Enterprise Management (3 credits)**

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management ^	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3
ECON 337	Agricultural Marketing	3

^ Course is a prerequisite for AN S 434

**Dairy Cattle Production Emphasis (6 credits)**

AN S 434	Dairy Systems Management	3
or AN S 435	Applied Dairy Farm Evaluation	
AN S 399A	Animal Science Internship: Graded Internship Experience	3

**Equine Science and Management Certificate Foundation Course (3 credits)**

AN S 216	Equine Science	3
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**Fundamental Disciplines in Animal Science (6 credits)**

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3

**Equine Expertise Expansion (6 credits)**

AN S 217	Equine Farm Practicum	2
AN S 306	Equine Evaluation	3
AN S 313	Exercise Physiology of Animals *	3
AN S 316	Equine Reproduction Lab	3
AN S 317A	Fundamentals of Equine Behavior and Training: Young Horses at Halter	1
AN S 317B	Fundamentals of Equine Behavior and Training: Yearlings	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

### Expertise Expansion (3 credits)

ACCT 215	Legal Environment of Business	3
AGEDS 451	Agricultural Law	3
AGRON 334	Forage Crop Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 337	Lactation	3
AN S 345	Growth and Development of Domestic Animals *	3
ECON 320	Labor Economics	3
ECON 334	Entrepreneurship in Agriculture	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

### Equine Management Emphasis (6 credits)

AN S 415	Equine Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

## Poultry Production Management Certificate

### Foundation Course (3 credits)

AN S 223	Poultry Science	3
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### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

### Expertise Expansion (3 credits)

AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3
AN S 373A	Poultry Products Technology #	3
AN S 373B	Applied Avian Physiology #	3
AN S 373C	Avian Health #	3
AN S 373D	Poultry Nutrition #	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

# Courses are held as part of the Midwest Poultry Consortium COE courses during the summer

### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

### Poultry Production Emphasis (6 credits, to include AN S 399 and choice of one 400-level management)

AN S 399A	Animal Science Internship: Graded Internship Experience	3
AN S 473A	Poultry Enterprise Management #	3
AN S 473B	Breeder Flock and Hatchery Management #	3

# Courses are held as part of the Midwest Poultry Consortium COE courses during the summer

## Swine Production Management Certificate

### Foundation Course (3 credits)

AN S 225	Swine Science	3
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### Fundamental Disciplines in Animal Science (9 credits)

AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 352	Genetic Improvement of Domestic Animals	3

### Expertise Expansion (3 credits)

AGRON 280	Crop Development, Production and Management	3
AN S 333	Embryo Transfer and Related Technologies	3
AN S 336	Domestic Animal Behavior and Well-Being *	3
AN S 345	Growth and Development of Domestic Animals *	3
AN S 360	Fresh Meat Science and Applied Muscle Biology *	3
AN S 380C	Employee Management for the Swine Industry	1
AN S 380D	Farrowing Management	1
AN S 380E	Swine Feed Mill Management	1
AN S 380F	Marketing and Risk Management in the Swine Industry	1
AN S 380G	Swine Nursery and Finishing Management	1
AN S 382	Swine Environment Management	1
AN S 383	Swine Manure and Nutrient Management	1
AN S 384	Swine Health and Biosecurity	1

TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management *	3
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
VDPAM 487	Livestock Disease Prevention *	3

\* Courses fulfill the Animal Science degree discipline expansion requirement unless designated as a unique course in the certificate

### Enterprise Management (3 credits)

AGEDS 451	Agricultural Law	3
ECON 230	Farm Business Management	3
ECON 235	Introduction to Agricultural Markets	3
ECON 332	Cooperatives	3
ECON 334	Entrepreneurship in Agriculture	3

### Swine Production Emphasis (6 credits)

AN S 425	Swine Systems Management	3
AN S 399A	Animal Science Internship: Graded Internship Experience	3

## Graduate Study

The department offers work for the degrees master of science and doctor of philosophy with majors in animal breeding and genetics; meat science; animal physiology; animal science; and an interdepartmental program in nutritional sciences which has an option in animal nutrition. Minor work is offered in these areas to students taking major work in other departments.

A strong undergraduate program is required for students interested in graduate study. Fundamental training in biology, chemistry, mathematics, and statistics is requisite to a satisfactory graduate program. Graduate programs in animal science include supporting work in areas such as agricultural engineering, agronomy; anatomy; biochemistry; chemistry; economics; environmental science; food science and human nutrition; genetics; microbiology; physics; physiology; and statistics. Students may choose graduate programs involving a co-major with one of these areas. Graduate work in meat science is offered as a co-major in animal science and food science and human nutrition.

The department also cooperates in the interdepartmental program in professional agriculture and interdepartmental majors in genetics, immunobiology, microbiology, MCDB (molecular, cellular, and developmental biology), neuroscience, nutritional sciences, and toxicology (see Index (<http://catalog.iastate.edu/azindex/>)).

The foreign language requirement, if any, is established on an individual basis by the program-of-study committee appointed to guide the work of the student.

## Biochemistry (AGLS)

The Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology (<https://www.bbmb.iastate.edu>) offers majors in biochemistry in the College of Liberal Arts and Sciences and in the College of Agriculture and Life Sciences. Biochemists seek to understand life processes in terms of chemical and physical principles. Students in the biochemistry majors develop foundational analytical skills while exploring frontiers in biotechnology and medicine. Graduates in biochemistry will have a rigorous background in chemistry, biology, and physics. Biochemistry coursework focuses on the development of problem-solving skills, critical thinking, communication, and research design. The Biochemistry degree includes focused specializations towards professional goals, including three prescribed options: **Research & Biotechnology**, **Pre-Medicine**, and **Biophysics**.

Graduates with a Biochemistry B.S. degree will be prepared for postgraduate studies in the chemical or biological sciences, medical and health professional training, or immediate laboratory research in biochemistry, biotechnology, or pharmacy. Graduates are also equipped to pursue careers in teaching, technical writing, science communication and policy, intellectual property law, and biotechnology entrepreneurship. The biochemistry major is accredited by the American Society for Biochemistry and Molecular Biology (ASBMB). As such our learning objectives align with ASBMB core concepts.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Explain and provide examples to illustrate the biochemical principles underlying the following:
  - a. How energy is required and transformed in biological systems.
  - b. How macromolecular structure determines function and regulation.
  - c. How information storage and flow are dynamic and interactive.
  - d. How biochemistry and biology are driven by evolution and homeostasis
- Apply and justify appropriate techniques to characterize and quantify biomolecules in biological systems.
- Execute effective multimodal communication of the research process and results.
- Implement and justify best practices for laboratory safety and research ethics.

### College of Agriculture and Life Sciences Learning Outcomes

Graduates with a Biochemistry B.S. degree from the College of Agriculture and Life Sciences should be able to:

- Explain the role of biochemistry in biotechnology entrepreneurship, pharmaceuticals, agriculture, and allied fields.
- Demonstrate collaboration and leadership in research teams.
- Explain biochemical cycles that impact global ecosystems.

## Biochemistry Major in the College of Agriculture and Life Sciences

The Bachelor of Science (B.S.) degree in Biochemistry requires the Biochemistry Core and one of the following three prescribed options. The options represent focused specializations for professional goals, including **Research & Biotechnology**, **Pre-Medicine**, and **Biophysics**. As majors in the College of Agriculture and Life Sciences, Biochemistry students must meet College of Agriculture and Life Sciences and University-wide requirements for graduation in addition to those stated below. Focus option-approved science electives can be found on the Biochemistry website (<https://www.bbmb.iastate.edu/approved-course-lists/>).

### Total Degree Requirement: 120 cr.

CALS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### International Perspective: 3 cr.

3 cr. from approved International Perspective list: <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)

### U.S. Diversity: 3 cr.

3 cr. from approved U.S. Diversity list: <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)

## College of Agriculture and Life Sciences General Education Electives: 9 cr.

### Humanities

3 cr. from approved humanities list: <http://www.cals.iastate.edu/student-services/humanities> (<http://www.cals.iastate.edu/student-services/humanities/>)

### Social Sciences

3 cr. from approved social sciences list: <http://www.cals.iastate.edu/student-services/social-sciences> (<http://www.cals.iastate.edu/student-services/social-sciences/>)

### Ethics

3 cr. from approved ethics list: <http://www.cals.iastate.edu/student-services/ethics> (<http://www.cals.iastate.edu/student-services/ethics/>)

## Communications Proficiency: 11 cr.

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
SP CM 212	Fundamentals of Public Speaking	3
LIB 160	Introduction to College Level Research	1
BBMB 311	Writing Scientific Reports in Biochemistry *	1
*BBMB 311 fulfills the upper-level Communications Proficiency Requirement		
<b>Total Credits</b>		<b>11</b>

## Biochemistry Core

The major in biochemistry requires completion of the Biochemistry Core and one of three focus options. Each defined option includes specific supporting coursework in Biology; Chemistry; Mathematics and/or Statistics.

BBMB 101	Introduction to Biochemistry	1
BBMB 102	Introduction to Biochemistry Laboratory	1
BBMB 201	Chemical Principles in Biological Systems	2
BBMB 311	Writing Scientific Reports in Biochemistry <sup>1</sup>	1
BBMB 312	Experimental Research Skills in Biochemistry	2
BBMB 404	Biochemistry I	3-4
or BBMB 504 & BBMB 505	Amino Acids and Proteins and Bioenergetics and Metabolism	
BBMB 405	Biochemistry II	3-4
or BBMB 506 & BBMB 507	Membrane Biochemistry and Biochemistry of Nucleic Acids	
BBMB 410	Analysis of Scientific Literature	2
BBMB 411	Techniques in Biochemical Research	4
BBMB 461	Molecular Biophysics	2
BBMB 561L	Laboratory in Molecular Biophysics	2-3
or CHEM 322L	Laboratory in Physical Chemistry	
PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	5
PHYS 232 & 232L	Introduction to Classical Physics II and Introduction to Classical Physics II Laboratory	5

BBMB 499	Undergraduate Research (highly encouraged elective)	arr †
<b>Total Credits</b>		<b>33-36 †</b>

† Arranged with instructor.

<sup>1</sup> BBMB 311 fulfills the ISU upper-level Communication Proficiency requirement.

#### Biochemistry Program of Study: Research & Biotechnology

Students interested in careers in biotechnology research and/or graduate studies in biochemistry, chemistry, or bioscience fields may opt for the Research & Biotechnology Option. The College of Agriculture and Life Sciences (CALS) electives allow specialization in agricultural biochemistry or plant biochemistry.

In addition to the Biochemistry Core (above):

CHEM 201 or CHEM 177 & CHEM 178	Advanced General Chemistry General Chemistry I and General Chemistry II	5-7
CHEM 201L or CHEM 177N or CHEM 177L	Laboratory in Advanced General Chemistry Laboratory in General Chemistry I Laboratory in General Chemistry I	1
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
CHEM 333L or CHEM 331L	Laboratory in Organic Chemistry I (for Chemistry and Biochemistry Majors) Laboratory in Organic Chemistry I	1-2
CHEM 334L or CHEM 332L	Laboratory in Organic Chemistry II (for Chemistry and Biochemistry Majors) Laboratory in Organic Chemistry II	1-2
MATH 165 & MATH 166	Calculus I and Calculus II	8
STAT 201 or STAT 305	Introduction to Statistical Concepts and Methods Engineering Statistics	4
BIOL 211	Principles of Biology I	3
BIOL 212	Principles of Biology II	3
BIOL 313 & 313L	Principles of Genetics and Genetics Laboratory	4
BIOL 314	Principles of Molecular Cell Biology	3
Agricultural & Molecular Sciences from approved list		9
<b>Total Credits</b>		<b>51-55</b>

#### Biochemistry Program of Study: Pre-Medicine

Students interested in qualifying for medical school training for careers as a Doctor of Medicine (MD) or Doctor of Osteopathic Medicine (DO) may opt for the Pre-Medicine Option. Allied health professions (e.g., Physician's Assistant, Dentistry, and Ophthalmology) may also consider the Pre-Medicine Option. The CALS option is especially suited to careers in Veterinary Medicine.

In addition to the Biochemistry Core (above):

CHEM 177 & 177L & CHEM 178 & CHEM 178L or CHEM 201 & 201L	General Chemistry I and Laboratory in General Chemistry I and General Chemistry II and Laboratory in College Chemistry II Advanced General Chemistry and Laboratory in Advanced General Chemistry	6-9
CHEM 325	Chemical Thermodynamics	3
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	4
CHEM 332 & 332L	Organic Chemistry II and Laboratory in Organic Chemistry II	4
MATH 165 & MATH 166	Calculus I and Calculus II	8
STAT 201 or STAT 305	Introduction to Statistical Concepts and Methods Engineering Statistics	3-4
PSYCH 101 or PSYCH 230	Introduction to Psychology Developmental Psychology	3
SOC 134	Introduction to Sociology	3
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 313	Principles of Genetics	3
BIOL 314	Principles of Molecular Cell Biology	3
Physiology & Bioscience Electives from approved list		6
<b>Total Credits</b>		<b>54-58</b>

#### Biochemistry Program of Study: Biophysics

Students interested in research careers focused on the biophysical basis of life processes may opt for the Biophysics Option. The CALS electives offer specialization in agricultural biophysics or plant biophysics.

In addition to the Biochemistry Core (above):

CHEM 201 or CHEM 177 & CHEM 178	Advanced General Chemistry General Chemistry I and General Chemistry II	5-7
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CHEM 201L	Laboratory in Advanced General Chemistry	1
or CHEM 177N	Laboratory in General Chemistry I	
or CHEM 177L	Laboratory in General Chemistry I	
CHEM 324	Introductory Quantum Mechanics	3
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
MATH 165	Calculus I	8
& MATH 166	and Calculus II	
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
MATH 317	Theory of Linear Algebra	4
STAT 201	Introduction to Statistical Concepts and Methods	4
or STAT 305	Engineering Statistics	
or STAT 231	Probability and Statistical Inference for Engineers	
COM S 207	Fundamentals of Computer Programming	3
BIOL 211	Principles of Biology I	3
BIOL 212	Principles of Biology II	3
Agricultural & Physical Sciences from approved list		6
Total Credits		56-58

**Four Year Plans**  
**Biochemistry B.S. Program of Study, College of**  
**Agriculture and Life Sciences**  
***Research & Biotechnology Option***  
**Sample Four-Year Plan**

First Year		
Fall	Credits Spring	Credits
BBMB 101	1 BBMB 102	1
BBMB 110	1 BBMB 111	1
MATH 165	4 MATH 166	4
CHEM 177	4 CHEM 178	3
CHEM 177N	1 BIOL 211	3
LIB 160	1 SP CM 212	3
ENGL 150	3	
15		15

Second Year		
Fall	Credits Spring	Credits
MATH 265, 266, 267, STAT 201, or STAT 305	3-4 BBMB 201	2
CHEM 331	3 CHEM 332	3
CHEM 331L	1 CHEM 332L	1
PHYS 231	4 PHYS 232	4

PHYS 231L	1 PHYS 232L	1
BIOL 212	3 ENGL 250	3
	BBMB 499	1
15-16		15
Third Year		
Fall	Credits Spring	Credits
BBMB 404	3 BBMB 405	3
BBMB 311*	1 BIOL 314	3
BBMB 312	2 BBMB 410	2
BIOL 313	3 BBMB 499	2
BIOL 313L	1 International Perspectives Elective	3
BBMB 499	2 General Education Elective	3
General Education Elective	3	
15		16

Fourth Year		
Fall	Credits Spring	Credits
BBMB 411	4 CHEM 325	3
Upper-level Agriculture or Mol. Sci. Elective	3 CHEM 322L or BBMB 461 and BBMB 561L	3-4
Upper-level Agriculture or Mol. Sci. Elective	3 BBMB 499	2
BBMB 499	2 Upper-level Agriculture or Mol. Sci. Elective	3
General Education Elective	3 U.S. Diversity Elective	3
15		14-15

"General Education Electives" include 3 credits each in Humanities, Ethics, and Social Sciences.

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

**Biochemistry B.S. Program of Study, College of**  
**Agriculture and Life Sciences**  
***Pre-Medicine Option***  
**Sample Four-Year Plan**

First Year		
Fall	Credits Spring	Credits
BBMB 101	1 BBMB 102	1
BBMB 110	1 BBMB 111	1
MATH 165	4 MATH 166	4
CHEM 177	4 CHEM 178	3
CHEM 177N	1 CHEM 178L	1

LIB 160	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
<b>15</b>		<b>14</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 212	3 BBMB 201	2
BIOL 212L	1 CHEM 332	3
CHEM 331	3 CHEM 332L	1
CHEM 331L	1 PHYS 232	4
PHYS 231	4 PHYS 232L	1
PHYS 231L	1 ENGL 250	3
PSYCH 101	3	
<b>16</b>		<b>14</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 404	3 BBMB 405	3
BBMB 311*	1 BIOL 314	3
BBMB 312	2 BBMB 410	2
BIOL 313	3 BBMB 499	2
STAT 201	4 SOC 134	3
General Education Elective	3 International Perspectives Elective	3
<b>16</b>		<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 411	4 CHEM 325	3
Upper-level Upper-level Physiology & Biosci. Elective	3 CHEM 322L or BBMB 461 <i>and</i> BBMB 561L	3-4
BBMB 499	2 BBMB 499	2
SP CM 212	3 Upper-level Physiology & Biosci. Elective	3
General Education Elective	3 U.S. Diversity Elective	3
<b>15</b>		<b>14-15</b>

"General Education Electives" include 3 credits each in Humanities and Ethics. MCAT recommended Soc 134 satisfies the Social Sciences requirement.

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

## Biochemistry B.S. Program of Study, College of Agriculture and Life Sciences

### *Biophysics Option*

### Sample Four-Year Plan

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 101	1 BBMB 102	1
BBMB 110	1 BBMB 111	1
MATH 165	4 MATH 166	4
CHEM 177	4 CHEM 178	3
CHEM 177N	1 BIOL 211	3
LIB 160	1 SP CM 212	3
ENGL 150	3	
<b>15</b>		<b>15</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MATH 265	4 BBMB 201	2
CHEM 331	3 CHEM 332	3
PHYS 231	4 PHYS 232	4
PHYS 231L	1 PHYS 232L	1
BIOL 212	3 ENGL 250	3
	BBMB 499	1
	International Perspective Elective	3
<b>15</b>		<b>17</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 404	3 BBMB 405	3
BBMB 311*	1 CHEM 325	3
BBMB 312	2 BBMB 410	2
COM S 207	3 MATH 317	4
BBMB 499	1 BBMB 499	2
U.S. Diversity Elective	3	
General Education Elective	3	
<b>16</b>		<b>14</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 411	4 CHEM 324	3
BBMB 499	2 CHEM 322L or BBMB 461 <i>and</i> BBMB 561L	3-4
STAT 231	4 BBMB 499	3
Upper-level Agricultural or Phys. Elective	3 Upper-level Agricultural or Phys. Elective	3

General Education Elective	3 General Education Elective	3
	<b>16</b>	<b>15-16</b>

"General Education Electives" include 3 credits each in Humanities, Ethics, and Social Sciences.

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

## The Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology offers a minor in Biochemistry.

BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
BBMB 312	Experimental Research Skills in Biochemistry	2
One course from the following:		2-3
BBMB 461	Molecular Biophysics (2 cr)	
BBMB 561	Molecular Biophysics (2 cr)	
CHEM 325	Chemical Thermodynamics (3 cr)	
300+ level courses in BBMB or CHEM to 15 cr total		5-6
<b>Total Credits</b>		<b>15-17</b>

All minors require at least 15 credits, including at least 6 credits in course numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Concurrent Bachelor of Science (B.S.)/ Master of Science (M.S.) Degrees

The department offers a concurrent enrollment degree program in either Biochemistry or Biophysics that allows ISU undergraduate students to obtain both the B.S. and M.S. degrees in about five years. The program is open to undergraduate students in the College of Liberal Arts and Sciences and in the College of Agriculture and Life Sciences. The concurrent degrees can be useful to students entering various career tracks. For those considering careers as research specialists, entry positions with higher-level responsibilities, and a higher-level salary, are made possible with the M.S. degree. For those considering careers as research directors, which require advanced study, the M.S. degree provides an advantage for admission into Ph.D. programs at the most competitive and prestigious graduate schools. Similarly, the M.S. degree can be a competitive advantage for admission in to medical, dental, law, veterinary medicine, or other professional schools.

Application to the program is made near the end of the junior undergraduate (third) year. Concurrent B.S./M.S. degree students begin research for the M.S. thesis during the summer semester after their junior year and are eligible for research assistantships, which are renewable based on academic standing and satisfactory research performance.

The M.S. thesis requires intensive experience in original, independent laboratory research under the close supervision of a faculty mentor. To apply, see the concurrent B.S./M.S. application instructions found on the department's Graduate Study web page (<https://www.bbmb.iastate.edu/graduate-study/>).

## Concurrent Bachelor of Science/Graduate Certificate

The Bachelor of Science /Graduate Certificate program is intended for exceptional undergraduate students majoring in Biochemistry. In this program, the student completes all of the requirements for the B.S. degree and the graduate certificate in a four-year period by combining the requirements of the two programs. The student enters the Graduate College after he/she achieves junior status and develops a plan of coursework (graduate and undergraduate) subject to the approval of the Director of Certificate (DOC). Required graduate courses are BBMB 504, BBMB 505, BBMB 506, BBMB 507, BBMB 561 and BBMB 561L. The student must satisfy the requirements of the B.S. in Biochemistry (121 credits) and the Graduate Certificate in Biochemistry (12 credits). Six credits of graduate coursework can satisfy some requirements of the B.S. degree. To apply for the B.S./Graduate Certificate, submit the application form found on the Graduate College Forms web page.

Biochemistry and Biophysics are the science and technology used to understand the mechanisms underlying biological processes at the molecular level, with an emphasis on the fundamental relationships among the chemical, physical, and biological sciences. The Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology (BBMB) administers Doctor of Philosophy (Ph.D.), Master's (M.S.), and Graduate Certificate programs (<https://www.bbmb.iastate.edu/graduate-study/>) that lead to an advanced degree or certificate in these disciplines. The prerequisite to graduate study is a sound undergraduate background in biology, chemistry, mathematics, and physics.

BBMB offers Doctor of Philosophy and Master's degrees in Biochemistry and in Biophysics that are designed to train students to independently conceive and carry out original research. BBMB also offers two graduate certificate programs in Biochemistry that provide a mechanism for formal recognition of focused graduate study in a specialized area that is less comprehensive than that required for a master's degree. BBMB participates in the Interdepartmental majors of Bioinformatics and Computational Biology; Genetics and Genomics; Immunobiology; Molecular, Cellular, and Developmental Biology; Neuroscience; Plant Biology; and Toxicology. All graduate degree students in BBMB are required to teach as part of their training.

## Master's (M.S.) Degree

The M.S. degree programs in Biochemistry and in Biophysics are useful for students who prefer to undertake research training without the longer-term commitment required for the Ph.D. degree. It is also useful for students interested more in the technical aspects of research rather than

in careers as research directors. The program requires about 3 years on average to complete and the successful defense of an independent research dissertation is required. About half the time required to earn the degree is spent on advanced coursework and professional seminars, and the other half is devoted to research undertaken in the laboratory under the close supervision of a faculty mentor. Financial support is available.

To apply, applicants first submit the free BBMB online application found on the department website, which is used as a screening tool.

NOTE: Students interested in a research career are encouraged to consider the Ph.D. track. Students may enter the Biochemistry or Biophysics M.S. degree program as a direct admit to a faculty research group at any time during the year.

## Doctor of Philosophy (Ph.D.) Degree

The Ph.D. programs in Biochemistry and in Biophysics are designed to train students in the ability to independently conceive and carry out original research in the general area of the chemistry or physics of the processes of life. The programs require about 5-6 years on average to complete and the successful defense of an independent research dissertation. The majority of the time required to earn the degree is spent doing research on the dissertation project in the laboratory under the close supervision of a faculty mentor. Considerable time also is devoted to advanced coursework and professional seminars. Financial support is available. To apply, applicants first submit the free BBMB online application found on the department website, which is used as a screening tool. Students may enter the Biochemistry or Biophysics Ph.D. degree programs either as a rotation student in the fall semester or as a direct admit to a faculty research group at any time during the year.

## Minor in Biochemistry

Graduate students in other M.S. and/or Ph.D. programs at ISU can earn a graduate minor in Biochemistry by completing 12 credits of the following courses with a grade point average of 3.0 or above: at least 6 credits from BBMB 504, BBMB 505, BBMB 506 and BBMB 507 and at least 6 credits of other BBMB 500- and 600-level courses. A student wishing to declare a minor in Biochemistry should arrange for a member of the graduate faculty in Biochemistry to serve on the POS Committee and submit the required form found on the Graduate College Forms page.

## Graduate Certificate in Biochemistry

The graduate certificate in Biochemistry is designed for students who have a B.S. degree in Biochemistry or a related field and wish to advance their knowledge by taking additional coursework at the graduate level.

The graduate certificate courses may be taken either on-line or on campus. Candidates for a graduate certificate in Biochemistry are admitted in the Graduate College. A total of 12 credits is required that include BBMB 504, BBMB 505, BBMB 506 and BBMB 507, plus four additional credits of BBMB coursework at the 500-level. The 12 credits earned in the graduate certificate program may be applied to meet the

course requirements of a M.S. or Ph.D. program in Biochemistry at Iowa State University (ISU) if the student is accepted into one of these programs. To apply for the graduate certificate in Biochemistry, submit the ISU online application.

# Biology

## Interdepartmental Undergraduate Program

Iowa State University is a major center for research and education in the biological sciences. With over 200 faculty in the life sciences, students have the opportunity to learn from some of the nation's leaders in biological research and teaching and to participate in innovative, meaningful research projects that explore frontiers of biology. Few other universities have such a wealth of faculty expertise available to undergraduate students, making Iowa State's Biology Program the logical choice for those who want to participate in a thriving academic community.

The faculties of the Department of Ecology, Evolution, and Organismal Biology and the Department of Genetics, Development, and Cell Biology jointly offer the undergraduate biology major. This high quality academic program has the flexibility to accommodate a range of career goals while taking advantage of the university's strengths in science and technology. A bachelor's degree in biology provides excellent preparation for graduate study in biological disciplines ranging from the molecular to the ecological levels, and for entrance into various professional schools, such as human medicine, physical therapy, or veterinary medicine. The major is well suited for those who plan to teach biology, who wish to enter government or industrial employment in health or environmental professions, or who prefer educational breadth as an end in itself. By working with our professional advisors, it is possible to design a unique program of study that will meet student needs and objectives.

Students with special interests and aptitudes should consider combining biology with a minor or a second major in another subject, such as chemistry, environmental studies, journalism, mathematics, music, statistics, or many other subjects offered by the university.

## Customizing a degree

Biology encompasses an amazing diversity of disciplines and scales of study ranging from molecules to the biosphere. The Biology major offers a rich variety of coursework addressing most of the areas of biology. The major's curriculum requirements offer tremendous flexibility in creating an individualized program of study to facilitate achievement of a student's career goals, while simultaneously assuring some exposure to all areas of biology and providing complementary knowledge from supporting courses in chemistry, physics, and math/statistics.

While flexibility is the hallmark of the Biology major, the breadth of the field can also be challenging. Thus, in an effort to provide more guidance to students who desire such, the major also provides six advising tracks, or areas of specialization, for students who wish to focus on subfields of biology or who have specific career goals in mind. Course plans for each area of specialization are listed on the Biology web site. The areas are:

**Pre-medical and Human Health Professions**—This area emphasizes preparation for further study in medical school or allied human health professions such as dentistry, optometry, genetic counseling, physical therapy, occupational therapy, physician assistant, nursing, chiropractic, and others. It also will prepare students for a broad range of careers in the biological sciences. Students are urged to determine the specific entrance requirements for the professional schools where they might study and to plan a program of study accordingly, in addition to following the basic plan.

**Pre-veterinary**—An eventual degree in Veterinary Medicine can lead to a wide variety of careers, including private clinical practice in small animal medicine or agricultural animal production. But, pre-veterinary students can also prepare themselves for careers in animal research, public health, laboratory animal medicine, food safety, regulatory medicine, and education. Specific requirements for entrance to the Iowa State Veterinary College or other schools should be consulted as programs of study are planned, in addition to following the basic plan.

**Molecular and Cellular Biology**—Students specializing in this field will explore the structure, function, and interactions of the molecules and sub-cellular features that make up living cells. This area is particularly designed for those who plan to pursue a career in research in molecular or cell biology or in related areas such as biochemistry, genetics, microbiology, developmental biology, human medicine, or veterinary medicine. Many students in this area will choose to go on to graduate school.

**Ecology and Conservation Biology**—Ecologists examine the interactions and relationships that living organisms have with each other and their environment. Conservation biologists study the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction and loss. Students who choose this specialization may go on to work for a non-profit environmental group; an environmental consulting firm; a local, state, or federal agency; or other related organizations. Many students in this area will choose to go on to graduate school.

**Evolution and Biodiversity**—This area provides students with a sound understanding of evolutionary principles and the biological patterns that result from evolutionary change. Students have the opportunity to explore, in depth, the biodiversity found within a wide range of groups of organisms. Students who choose this specialization may go on to work for a non-profit environmental group; an environmental consulting firm;

a local, state, or federal agency; or other related organizations. Many students in this area will choose to go on to graduate school.

**Teacher licensure**—Biology majors seeking recommendation for licensure to teach biology in secondary schools must meet requirements of the Teacher Education Program as well as those of the Biology Program. In addition, they must apply formally for admission to the teacher education program. See the section on Teacher Education for a list of licensure areas, degree requirements, and other information about this program.

## Other opportunities

**Undergraduate research**—Students who have interests in biological research are encouraged to become involved in the research projects of faculty members on campus. Those doing so may receive credit for the experience in BIOL 499 Undergraduate Research Experience.

Making the effort to find a suitable research mentor and engaging in research work can be one of the most valuable experiences of an undergraduate education. Internship experiences are often available at other universities, zoos, museums, governmental and non-governmental entities focused on environmental issues, and industrial or government laboratories. Students participating in such projects may receive internship credit in BIOL 494 Biology Internship.

**Field trip courses** – The Biology Program offers two field trip courses: BIOL 393 (North American Field Trips in Biology) and BIOL 394 (International Field Trips in Biology). In recent years field trip opportunities to Honduras and Spain have been available. These courses involve a pre-trip seminar followed by one-week to one-month long field trip at a time when academic year classes are not in session. The classes are low enrollment and allow extensive interaction between instructors and students in locations of biological interest.

**International experience**—Because major discoveries in science often result from global efforts, biology majors are encouraged to include an international or study abroad component in their degree programs. This can be done by participating in international field trips originating from the ISU campus in BIOL 394 International Field Trips in Biology. In addition, many students choose to study abroad, attending a university in another country for up to a year as an exchange student. Minors in a foreign language can also add an international emphasis to a degree in biology.

## Courses offered at other locations

In addition to biological science courses taught on campus, students may take courses at various remote locations and arrange to have the credits count toward the advanced courses required in the biology major.

Attending a summer field station adds an important component to an undergraduate program of study.

**Gulf Coast Research Laboratory**—The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi. Iowa State students

may register for marine biology courses and transfer credit to their degree programs under the number BIOL 480 Studies in Marine Biology. Written permission of the Biology Program Director is required for this arrangement.

**Summer Biological Field Stations**—Courses taken at summer field stations may be transferred to Iowa State University as credit in BIOL 481 Summer Field Studies. Such stations are found throughout the country and often offer courses that emphasize the adaptation of plants and animals to unique environments. See [www.biology.iastate.edu](http://www.biology.iastate.edu) (<http://www.biology.iastate.edu/>) for links to Iowa Lakeside Laboratory and other field stations in different biomes, e.g., marine/coastal, Great Lakes, taiga, deciduous forests, deserts, Rocky Mts., etc.

**Organization for Tropical Studies**—Iowa State students may register for courses in tropical biology taught in Costa Rica by the Organization for Tropical Studies. Credit is transferred to Iowa State as BIOL 482 Tropical Biology. For further information, contact the Biology Student Services Office in 103 Bessey Hall.

## Student Learning Outcomes

Upon graduation, students should be able to:

- Explain and apply the core biological concepts of:
  - Evolution
  - Structure and function
  - Information flow, exchange, and storage
  - Pathways and transformations of energy and matter
  - How systems are interconnected and interact
- Apply the process of science
- Use quantitative reasoning
- Use modeling and simulation
- Utilize, communicate with, and collaborate with other disciplines
- Understand the relationship between science and society

## Undergraduate Study

Biology majors start their studies in the biological sciences by taking a two-semester long Principles of Biology course sequence:

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1

During the first year, students also take BIOL 110 Introduction to Biology and BIOL 111 Opportunities in Biology, which are half-semester courses designed to introduce the student to the discipline of biology and

opportunities for careers in biology. Students transferring into the Biology major take BIOL 112 in place of BIOL 110 and BIOL 111.

Students then explore, in any order depending on their interests, four upper-level core courses including: concepts of ecology in BIOL 312; the principles of genetics in BIOL 313 and BIOL 313L; cell and molecular biology in BIOL 314; and evolutionary biology in BIOL 315. Biology majors must take an additional 21 credits of advanced biological science courses at the 300 level, or above, from an approved list of courses. Many of these courses have as prerequisites BIOL 211/L and BIOL 212/L, so students do not need to complete the four upper-level core courses before taking advanced courses. Of these advanced courses, at least 9 credits must be taken as BIOL courses, and a minimum of two laboratory or field courses must also be included from an approved list.

Biology majors should carefully consider their selection of upper-level courses to allow them to emphasize one, or more, of the sub-disciplines of Biology relevant to their post-baccalaureate objectives. Most biology courses numbered 300 or above can be used to satisfy the additional credit requirement. Some courses taught in other departments can also be applied to the biology major. Advanced students should consider including 500 level courses in their programs. The Biology Program's web site has a complete listing of acceptable upper-level life science courses.

Biology majors must demonstrate competency in their understanding of the biological sciences. A 2.0 cumulative average is required in biology and advanced biology coursework. In order to graduate, a student must have a cumulative average in the major of at least 2.00.

## General requirements

Students may earn the B.S. degree in Biology from either the College of Liberal Arts and Sciences or from the College of Agriculture and Life Sciences. Students in the College of Liberal Arts and Sciences must fulfill the College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated for the major. Students in the College of Agriculture and Life Sciences must meet University-wide requirements for graduation and requirements for that college. Contact the Student Services Office for details regarding differences in general education and course requirements that are specific to these colleges.

**Supporting course requirements** – Understanding biology requires a basic understanding of the physical sciences and mathematics. Consequently, a minimum number of credits in general chemistry, organic chemistry, biochemistry, and physics is required. See the Biology Program Web Site for specific supporting science requirements.

The Math requirement is competency based. After demonstrating competency in algebra and trigonometry, biology majors must take two semesters of calculus; or two semesters of Statistics; or one semester of calculus and one semester of Statistics chosen from a list of approved



courses available on the Biology Program Web Site and in the Biology Program Office.

Given the important role of communications in the modern sciences, biology majors must demonstrate communication competency by earning a minimum of C in ENGL 250 Written, Oral, Visual, and Electronic Composition or equivalent composition courses and in one advanced writing course numbered ENGL 302 through ENGL 316, or JL MC 347, or SP CM 212. (Students in the College of Agriculture and Life Sciences are required to earn a C or better in ENGL 150, as well.)

## Curriculum in Biology

Administered by the Departments of Ecology, Evolution, and Organismal Biology; and Genetics, Development and Cell Biology. Students should consult the Biology Student Services Office, 103 Bessey (or biology@iastate.edu) for the appropriate course selections for professional or graduate school preparation.

### Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### Biology: 23.5 cr.

2.00 GPA average required.

BIOL 110	Biology Major Orientation	1
BIOL 111	Opportunities in Biology	0.5
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 312	Ecology	4
BIOL 313	Principles of Genetics	3
BIOL 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 315	Biological Evolution	3
<b>Total Credits</b>		<b>23.5</b>

### Advanced Biology: 21 cr.

2.00 GPA average required. Must include two approved Advanced Biology labs. See the Biology Program website for list of approved Advanced Biology courses, or consult an advisor in the Biology Student Services office, 103 Bessey Hall.

Biology advanced courses (from approved list)	9
Additional approved biology advanced courses	12
<b>Total Credits</b>	<b>21</b>

### Mathematical Sciences 7 cr.

Students in College of Agriculture and Life Sciences must have a Math and Statistics.

MATH 160 or MATH 165 and STAT 101 or STAT 104

Or		
MATH 165	Calculus I	8
& MATH 166	and Calculus II	
Or		
STAT 101 or STAT 104 and STAT 301		4-7

### Physical Sciences

General Chemistry: 5 cr. minimum

CHEM 163	College Chemistry	5
& 163L	and Laboratory in College Chemistry	

Or		
CHEM 177	General Chemistry I	5
& 177L	and Laboratory in General Chemistry I	
CHEM 178	General Chemistry II	4
& 178L	and Laboratory in College Chemistry II	

Organic Chemistry: 4 cr. minimum

CHEM 231	Elementary Organic Chemistry	4
& 231L	and Laboratory in Elementary Organic Chemistry	

Or		
CHEM 331	Organic Chemistry I	4
& 331L	and Laboratory in Organic Chemistry I	

Biochemistry: 3 cr.

BBMB 316	Principles of Biochemistry	3
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Or		
BBMB 404	Biochemistry I	3

Or		
BBMB 420	Mammalian Biochemistry	3

Physics: 5 cr. minimum

PHYS 115	Physics for the Life Sciences	5
& 115L	and Laboratory in Physics for the Life Sciences	

Or		
PHYS 131	General Physics I	5
& 131L	and General Physics I Laboratory	

PHYS 132	General Physics II	5
& 132L	and General Physics II Laboratory	

### International Perspective: 3 cr.

### U.S. Diversity: 3 cr.

### Communication/Information Literacy

Students must earn a C or better in ENGL 250 and the advanced communication course. Additionally, students in the College of Agriculture and Life Sciences must earn a C or better in ENGL

150. Students should consult their advisor to discuss advanced communication course options other than SP CM 212.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

### Humanities and Social Sciences

Chosen from approved lists.

#### LAS - Biology

Note: Students must have completed 3 years of a single world language or take 4-8 credits of university level world language.

Humanities	12
Social Sciences	9
Career Preparation (LAS 203)	1
<b>Total Credits</b>	<b>22</b>

### Humanities and Social Sciences

Chosen from approved lists.

#### CALS - Biology

Note: Students in CALS - Biology must take an approved speech course and an approved Math and Statistics course.

Humanities	3
Social Sciences	3
Ethics	3
Total Credits	9

### Biology, B.S. (College of Agriculture and Life Sciences)

The minimum number of credits required to graduate is 120. Students are required to take 21 credits in advanced biology of which 9 credits must be from the Biology Program (BIOL). At least two advanced courses must have a lab or field component.

## General Sample Plan

### Freshman

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 Chemistry*		4	
BIOL 211L		1 Social Science Choice		3	
CHEM 163 or 177*		4 Math/Stat Choice*		4	
CHEM 163L or 177L*		1			
ENGL 150 or 250		3			
LIB 160		1			
		<b>14.5</b>		<b>15</b>	<b>0</b>

### Sophomore

Fall	Credits	Spring	Credits
ENGL 250 (or Elective)		3 BIOL 313	3
BIOL 314		3 BIOL 313L	1
Chemistry or Elective*		3-4 Biochemistry*	3
Advanced Biology		3 Math/Stat Choice*	4
Humanities Choice		3 Elective Choice	3
		<b>15-16</b>	<b>14</b>

### Junior

Fall	Credits	Spring	Credits
BIOL 312		4 BIOL 315	3

Advanced Biology	3 Advanced Biology with Lab	4
PHYS 115 or 131*	4 PHYS 132 (or Elective)*	4
PHYS 115L or 131L*	1 PHYS 132L (or Elective)*	1
Ethics Choice	3 U.S. Diversity	3
<b>15</b>		<b>15</b>

**Senior**

Fall	Credits	Spring	Credits
Advanced Biology	4	Advanced Biology with Lab	4
International Perspectives	3	Advanced Biology	3
SP CM 212 or COMST 214	3	Minor or Electives	9
Minor or Electives	6		
<b>16</b>		<b>16</b>	

**Total Credits: 120.5-121.5**

\* Students should meet with an academic advisor to determine the proper plans for chemistry, math and physics before selecting those options above.

**Biology, B.S. (College of Agriculture and Life Sciences)****Pre-Medical Sample Plan**

Please note that professional school requirements vary by program.

**Freshman**

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 CHEM 178		3	
BIOL 211L		1 CHEM 178L		1	
CHEM 177		4 MATH 160 or 165		4	
CHEM 177L		1 PSYCH 101		3	
ENGL 150 or 250		3			
LIB 160		1			
<b>14.5</b>		<b>15</b>		<b>0</b>	

**Sophomore**

Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology Choice	3
CHEM 331		3 BIOL 313	3
CHEM 331L		1 BIOL 313L	1
ENGL 250 (or Elective)		3 CHEM 332	3
STAT 104 or 101		3-4 CHEM 332L	1
FS HN 367		1 Ethics Choice Elective	3
<b>14-15</b>		<b>16</b>	

**Junior**

Fall	Credits	Spring	Credits
BBMB 316 or 404		3 BBMB 405 (Or Advanced Biology Choice)	3
BIOL 350		4 BIOL 335	3
SOC 134		3 BIOL 335L	1
PHYS 131		4 US Diversity	3
PHYS 131L		1 PHYS 132 PHYS 132L Take MCAT in May or June Submit application in June or July	4 1
<b>15</b>		<b>15</b>	

**Senior**

Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3
SP CM 212 or COMST 214		3 BIOL 315	3
BIOL 312 (with lab)		4 Humanities Choice	3
International Perspectives		3 Elective	6
Elective	3		
<b>16</b>		<b>15</b>	

**Total Credits: 120.5-121.5****Biology, B.S. (College of Agriculture and Life Sciences)****Pre-Physician Assistant Sample Plan**

Please note that professional school requirements vary by program.

**Freshman**

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 CHEM 178		3	
BIOL 211L		1 CHEM 178L		1	
CHEM 177		4 MATH 160 or 165		4	
CHEM 177L		1 PSYCH 101		3	
ENGL 150		3			
LIB 160		1			
<b>14.5</b>		<b>15</b>		<b>0</b>	

**Sophomore**

Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology Choice	3
CHEM 231		3 BIOL 313	3
CHEM 231L		1 BIOL 313L	1
Or CHEM 331 & CHEM 331L		Elective	3
ENGL 250 (or Elective)		3 International Perspectives + Humanities Choice	3
STAT 104 or 101		3-4 PSYCH 230	3
FS HN 367		1	
<b>14-15</b>		<b>16</b>	

Junior			
Fall	Credits	Spring	Credits
BBMB 316		3 Advanced Biology	3
BIOL 312		4 BIOL 335	3
BIOL 350		4 BIOL 335L	1
Elective		2 US Diversity + Ethics	3
PSYCH 460		3 PHYS 115/ L or PHYS 131/L	5
		16	15
Senior			
Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3
Written Communication/ Speech		3 Elective	3
BIOL 315		3 Elective	3
Elective		3 Elective	3
Elective		3 Elective	3
		15	15

Total Credits: 120.5-121.5

Biology, B.S. (College of Agriculture and Life Sciences)

Pre-Physical Therapy Sample Plan

Please note that professional school requirements vary by program.

Freshman					
Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	

BIOL 211	3	CHEM 178	3
BIOL 211L	1	CHEM 178L	1
CHEM 177	4	MATH 160 or 165	4
CHEM 177L	1	PSYCH 101	3
ENGL 150 or 250	3		
LIB 160	1		
14.5		15	0

Sophomore			
Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology	3
CHEM 231		3 BIOL 313	3
CHEM 231L		1 BIOL 313L	1
ENGL 250 (or Elective)		3 Elective	3
STAT 101 or 104		3-4 International Perspectives +Humanities Choice	3
FS HN 367		1 Elective (Psych course recommended)	3
14-15		16	

Junior			
Fall	Credits	Spring	Credits
BBMB 316		3 Advanced Biology	3
US Diversity + Ethics		3 BIOL 335	3
BIOL 350		4 BIOL 335L	1
PHYS 131		4 Elective	3
PHYS 131L		1 PHYS 132	4
		PHYS 132L	1
15		15	

Senior			
Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3

SP CM 212 or COMST 214	3 Elective	3
BIOL 312 (with lab)	4 BIOL 315	3
Elective	3 Elective	3
Elective	3 Elective	3
<b>16</b>		<b>15</b>

**Total Credits: 120.5-121.5**

## Minor

A minor in Biology is offered by the Biology Program. The minor requires 15 credits in Biology and includes the completion of the specific courses listed below and 7 credits in biology courses numbered 300 or above. Nine (9) credits of the required courses must apply only to the minor. For more information, see the Biology Program web site or contact the Student Services Office in 103 Bessey Hall.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
<b>Total Credits</b>		<b>8</b>

## Graduate Programs

Biology is an undergraduate major only. Persons interested in graduate study in the biological sciences should apply directly to one of the life science graduate programs at Iowa State University.

### Programs

- Bioinformatics and Computational Biology
- Ecology and Evolutionary Biology
- Genetics
- Molecular Cellular and Developmental Biology
- Neuroscience
- Plant Biology
- Toxicology
- Immunobiology
- Environmental Science

### Interdisciplinary Graduate Studies

A non-thesis master's degree in Interdisciplinary Graduate Studies (biological sciences) has been established particularly for those who wish to have a more diversified program of advanced study than that generally permitted by specific departments and programs.

## Culinary Food Science (AGLS)

The Culinary Food Science degree program is a food science-based degree in which students develop basic culinary skills along with knowledge of the accompanying sciences. As a graduate, you'll combine food product development skills and entrepreneurial talents with scientific and technological knowledge.

The department also offers a culinary food science minor.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Culinary Food Science major.

## Degree Requirements

**Administered by the Department of Food Science and Human Nutrition**

### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

**Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

**Humanities and Social Sciences: 9-15 cr.**

FS HN 220	American Food and Culture	3
ECON 101	Principles of Microeconomics	3



If a Culinary Food Science student in the College of Human Sciences, 6  
select:

Additional Humanities course

Additional Humanities or Social Science course

### Ethics: 3 cr. (Included as part of the Humanities and Social sciences requirement)

FS HN 342 World Food Issues: Past and Present 3

### Mathematical Sciences: 6-8 cr.

Select at least 3 credits from: 3-4

MATH 140 College Algebra

MATH 143 Preparation for Calculus

MATH 160 Survey of Calculus

MATH 165 Calculus I

Select at least 3 credits from: 3-4

STAT 101 Principles of Statistics

STAT 104 Introduction to Statistics

**Total Credits 6-8**

### Physical Sciences: 9 cr.

CHEM 163 College Chemistry 4

or CHEM 177 General Chemistry I

CHEM 163L Laboratory in College Chemistry 1

or CHEM 177L Laboratory in General Chemistry I

CHEM 231 Elementary Organic Chemistry 3

CHEM 231L Laboratory in Elementary Organic Chemistry 1

**Total Credits 9**

### Biological Sciences: 10-11 cr.

BBMB 301 Survey of Biochemistry 3

BIOL 212 Principles of Biology II 3

BIOL 212L Principles of Biology Laboratory II 1

MICRO 201 Introduction to Microbiology 2-3

or MICRO 302 Biology of Microorganisms

MICRO 201L Introductory Microbiology Laboratory 1

or MICRO 302L Microbiology Laboratory

**Total Credits 10-11**

### Animal Science Coursework: 6 cr.

AN S 270 Foods of Animal Origin 2

AN S 270L Foods of Animal Origin Laboratory 1

AN S 460 Science and Technology of Value Added Meat Products 3

**Total Credits 6**

### Food Science and Human Nutrition: 42 cr.

FS HN 101 Food and the Consumer 3

FS HN 104 Introduction to Professional Skills in Culinary Science 1

FS HN 110 Professional and Educational Preparation 1

FS HN 167 Introductory Human Nutrition and Health 3

FS HN 203 Contemporary Issues in Food Science and Human Nutrition 1

FS HN 214 Scientific Study of Food 3

FS HN 215 Advanced Food Preparation Laboratory 2

FS HN 265 Nutrition for Active and Healthy Lifestyles 3

FS HN 305 Food Quality Management and Control 2

FS HN 311 Food Chemistry 3

FS HN 311L Food Chemistry Laboratory 1

FS HN 314 Professional Development for Culinary Food Science and Food Science Majors 1

FS HN 403 Food Laws and Regulations 2

FS HN 406 Sensory Evaluation of Food 3

FS HN 407 Microbiological Safety of Foods of Animal Origins 3

FS HN 411 Food Ingredient Interactions and Formulations 2

FS HN 412 Food Product Development 3

FS HN 420 Food Microbiology 3

Take one of the following courses for 2 credits: 2

FS HN 491B Supervised Work Experience: Food Science

or FS HN 49 Supervised Work Experience: Culinary Science

**Total Credits 42**

### Hospitality Management: 12 cr.

HSP M 133 Food Safety Certification 1

HSP M 380 Food Production Management 3

HSP M 380L Food Production Management Experience 3

HSP M 383 Wine and Spirits in Hospitality Management 2

or FS HN 509 Sensory Evaluation of Wines

HSP M 487 Fine Dining Management 3

**Total Credits 12**

### Electives 1-13 cr. Select from any university coursework to earn at least 120 total credits.

Go to FS HN courses.

### Culinary Food Science, B.S.

#### First Year

Fall	Credits	Spring	Credits
FS HN 110	1	FS HN 104	1
CHEM 163	4	FS HN 167	3
or 177			

CHEM 163L or 177L	1 BIOL 212	3
FS HN 101	3 BIOL 212L	1
MATH 140, 143, 160, or 165	3-4 ECON 101	3
ENGL 150	3 STAT 104 or 101	3-4
LIB 160	1	

16-17

14-15

**Second Year**

Fall	Credits	Spring	Credits
CHEM 231		3 FS HN 265	3
CHEM 231L		1 BBMB 301	3
ENGL 250		3 MICRO 201 or 302	2-3
FS HN 203		1 MICRO 201L or 302L	1
FS HN 220		3 FS HN 214	3
HSP M 133		1 FS HN 215	2
SP CM 212		3	
	15		14-15

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
AN S 270		2 FS HN 305		2 FS HN 491B or 491D	2
AN S 270L		1 FS HN 403			2
FS HN 311		3 HSP M 380			3
FS HN 311L		1 HSP M 380L			3
FS HN 314		1 Humanities or social science (H Sci) or elective (AgLS)			3
FS HN 411		2 Elective *			3
FS HN 420		3			
Electives *		1-3			
	14-16		16		2

**Fourth Year**

Fall	Credits	Spring	Credits
FS HN 406		3 AN S 460	3
FS HN 407		3 FS HN 342	3

FS HN 491B or 491D (if not yet completed)	2 FS HN 412	3
HSP M 383 (if not taking FS HN 509 Spring)	2 Humanities (H Sci) or Elective (AgLS)	3
HSP M 487	3 Elective *	3
U.S. Diversity	3	
	16	15

\* Choose elective courses to total equal to or greater than 120 credits.

Notes: Planned course offerings may change and students need to check the online Schedule of Classes each term to confirm course offerings: <https://classes.iastate.edu> (<https://classes.iastate.edu/>).

This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on the Culinary Food Science minor can be found here: [www.catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext](http://www.catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext).

## Dairy Science

Students majoring in Dairy Science will complete the degree requirements listed here. If desired, a student may also include the specialized option in pre-veterinary medicine. A minimum of 15 credits of animal science coursework must be earned at Iowa State University.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate a comprehensive knowledge of dairy science, dairy management, and agribusiness.
- Exhibit effective communication skills
- Integrate information to solve problems
- Effectively employ skills as a self -learner
- Participate as team leaders and team builders
- Demonstrate awareness of contemporary issues that drive change in animal industries

**Total Degree Requirement: 128 cr.**

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

**International Perspectives**

Approved International Perspectives course 3

**U.S. Diversity**

Approved U.S. Diversity course 3

**Communications Proficiency**

English composition 6

Speech fundamentals 3

**Total Credits** 9

**Communication/Library**

ENGL 150 Critical Thinking and Communication 3

ENGL 250 Written, Oral, Visual, and Electronic Composition 3

LIB 160 Introduction to College Level Research 1

One course from the following: 3

AGEDS 311 Presentation and Sales Strategies for Agricultural Audiences

AGEDS 327 Survey of Agriculture and Life Sciences Communication

COMST 214 Professional Communication

SP CM 212 Fundamentals of Public Speaking

**Total Credits** 10

**Humanities and Social Sciences**

Approved Humanities course 3

Approved Social Science course 3

**Total Credits** 6

**Ethics**

Approved Ethics course 3

**Mathematics and Business**

One course from the following: 3

ECON 101 Principles of Microeconomics

ECON 102 Principles of Macroeconomics

ACCT 284 Financial Accounting

One course from the following: 3-4

STAT 101 Principles of Statistics

STAT 104 Introduction to Statistics

STAT 226 Introduction to Business Statistics I

One course from the following: 3-4

MATH 140 College Algebra

MATH 150 Discrete Mathematics for Business and Social Sciences

MATH 160 Survey of Calculus

MATH 165 Calculus I

**Total Credits** 9-11

**Biological Sciences**

BIOL 211 Principles of Biology I 3

BIOL 211L Principles of Biology Laboratory I 1

BIOL 212 Principles of Biology II 3

BIOL 212L Principles of Biology Laboratory II 1

BIOL 313 Principles of Genetics 3

or GEN 320 Genetics, Agriculture and Biotechnology

MICRO 201 Introduction to Microbiology 3-4

& 201L and Introductory Microbiology Laboratory

or MICRO 302 Biology of Microorganisms

& 302L and Microbiology Laboratory

**Total Credits** 14-15

**Physical Sciences**

A minimum of 8 credits are required. These requirements are specific to option and are listed with each option below.

**Dairy Sciences Option**

AN S 101 Working with Animals 2

AN S 110 Orientation in Animal Science and ISU 1

AN S 114 Survey of the Animal Industry 2

AN S 210 Career Preparation in Animal Science 1

AN S 211 Issues Facing Animal Science 1

AN S 214 Domestic Animal Physiology 3

AN S 214L Domestic Animal Anatomy and Physiology Lab 1

AN S 235 Dairy Cattle Science 3

AN S 270 Foods of Animal Origin 3

& 270L and Foods of Animal Origin Laboratory

or FS HN 101 Food and the Consumer

AN S 319 Animal Nutrition 3

AN S 320 Animal Feeds and Feeding 3

AN S 331 Domestic Animal Reproduction 3

AN S 337 Lactation 3

AN S 352 Genetic Improvement of Domestic Animals 3

AN S 411 Addressing Issues in Animal Science 1

AN S 434 Dairy Systems Management 3

AN S 435 Applied Dairy Farm Evaluation 3

CHEM 163 College Chemistry 5

& 163L and Laboratory in College Chemistry

or CHEM 177 General Chemistry I

& 177L and Laboratory in General Chemistry I

CHEM 331	Organic Chemistry I	3
or BBMB 221	Structure and Reactions in Biochemical Processes	
Four credits (minimum) from the following:		4
AGRON 334	Forage Crop Management	
AN S 332	Laboratory Methods in Animal Reproduction	
or AN S 333	Embryo Transfer and Related Technologies	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	
ECON 332	Cooperatives	
FS HN 305	Food Quality Management and Control	
FS HN 403	Food Laws and Regulations	
FS HN 410	Food Analysis	
MICRO 310	Medical Microbiology	
MICRO 353	Introductory Parasitology	
MICRO 374	Insects and Our Health	
MICRO 402	Microbial Genetics and Genomics	
MICRO 407	Microbiological Safety of Foods of Animal Origins	
FS HN 420	Food Microbiology	
MICRO 420	Food Microbiology	
MICRO 475	Immunology	
VDPAM 487	Livestock Disease Prevention	

**Total Credits** **51**

Additional free electives for the Dairy Sciences option 26-29

#### Pre-Veterinary Medicine Option

AN S 101	Working with Animals	2
AN S 110	Orientation in Animal Science and ISU	1
AN S 114	Survey of the Animal Industry	2
AN S 210	Career Preparation in Animal Science	1
AN S 211	Issues Facing Animal Science	1
AN S 214	Domestic Animal Physiology	3
AN S 214L	Domestic Animal Anatomy and Physiology Lab	1
AN S 235	Dairy Cattle Science	3

AN S 270	Foods of Animal Origin	3
& 270L	and Foods of Animal Origin Laboratory	
or FS HN 101	Food and the Consumer	
AN S 319	Animal Nutrition	3
AN S 320	Animal Feeds and Feeding	3
AN S 331	Domestic Animal Reproduction	3
AN S 337	Lactation	3
AN S 352	Genetic Improvement of Domestic Animals	3
AN S 411	Addressing Issues in Animal Science	1
AN S 434	Dairy Systems Management	3
AN S 435	Applied Dairy Farm Evaluation	3
CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
BBMB 301	Survey of Biochemistry	3
or BBMB 316	Principles of Biochemistry	
or BBMB 404	Biochemistry I	
or BBMB 420	Mammalian Biochemistry	
PHYS 131	General Physics I	5
& 131L	and General Physics I Laboratory	
Four credits (minimum) from the following:		4
AGRON 334	Forage Crop Management	
AN S 332	Laboratory Methods in Animal Reproduction	
or AN S 333	Embryo Transfer and Related Technologies	
AN S 336	Domestic Animal Behavior and Well-Being	
AN S 345	Growth and Development of Domestic Animals	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
AN S 415	Equine Systems Management	
AN S 419	Advanced Animal Nutrition	
AN S 424	Companion Animal Systems Management	
AN S 425	Swine Systems Management	
AN S 426	Beef Cattle Systems Management	
AN S 429	Sheep Systems Management	
AN S 460	Science and Technology of Value Added Meat Products	
ECON 332	Cooperatives	
FS HN 403	Food Laws and Regulations	
FS HN 410	Food Analysis	
MICRO 310	Medical Microbiology	
MICRO 353	Introductory Parasitology	
MICRO 374	Insects and Our Health	

MICRO 402	Microbial Genetics and Genomics
MICRO 407	Microbiological Safety of Foods of Animal Origins
MICRO 421	Food Microbiology Laboratory

**Total Credits** **63**

Additional free electives for the Pre-Veterinary Medicine Option 11-14

\* The Iowa State University College of Veterinary Medicine academic requirements are met by completion of this option (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements> (<http://vetmed.iastate.edu/academics/prospective-students/admissions/academic-requirements/>)).

## Dairy Science, B.S. - general

### Freshman

Fall	Credits Spring	Credits
AN S 110	1 AN S 114	2
AN S 101	2 CHEM 177 or 163	4
BIOL 211	3 CHEM 177L or 163L	1
BIOL 211L	1 Humanities - elective list	3
ENGL 150	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4	
Social Science - elective list	3	
<b>17-18</b>		<b>16-17</b>

### Sophomore

Fall	Credits Spring	Credits
AN S 211	1 AN S 210	1
AN S 235	3 AN S 270 & 270L or FS HN 101	3
BIOL 212	3 AN S 214	3
BIOL 212L	1 AN S 214L	1
BBMB 221	3 ENGL 250	3
ECON 101	3 MICRO 201 or 302	2-3
Free elective	3 MICRO 201L or 302L	1
	Free elective	3
<b>17</b>		<b>17-18</b>

### Junior

Fall	Credits Spring	Credits
AN S 319	3 AN S 320	3
AN S 331	3 AN S 352	3
GEN 320 or BIOL 313	3 AN S 337	3
US diversity - elective list	3 Free elective	3

Free elective	3 Ethics - elective list	3
<b>15</b>		<b>15</b>

### Senior

Fall	Credits Spring	Credits
AN S 411	1 AN S 435	3
AN S 434	3 International perspective - elective list	3
AN S elective	3 AN S elective	3
Free Elective	3 Free elective	3
Free elective	3 Free Elective	4
Free elective	3	
<b>16</b>		<b>16</b>

Important Note: This is only one of many equally-sound schedule sequences.

Free electives and specified group electives are often chosen to complement the student's career focus. The student's academic advisor assists with developing scheduling schemes that prepare students individually for careers in the animal industry. They are explained fully in AN S 110 and through appointments with the student's advisor in Dairy Science. Typical career areas include Advanced Degree in Dairy Science, Business and Finance, Agriculture Promotion and Information, Dairy Food Industry, Agricultural Sales and Marketing, International Agriculture, Animal Production and General Agribusiness and Pre-Veterinary Medicine.

## Dairy Science, B.S. - pre-veterinary medicine option

### Freshman

Fall	Credits Spring	Credits
AN S 110	1 AN S 114	2
AN S 101	2 CHEM 177	4
BIOL 211	3 CHEM 177L	1
BIOL 211L	1 Humanities - elective list	3
ENGL 150	3 SP CM 212, AGEDS 311, AGEDS 327, or COMST 214	3
LIB 160	1 STAT 101, 104, or 226	3-4
MATH 140, 150, 160, or 165	3-4	
Social Science - elective list	3	
<b>17-18</b>		<b>16-17</b>

### Sophomore

Fall	Credits Spring	Credits
AN S 211	1 AN S 210	1
AN S 235	3 AN S 270 & 270L or FS HN 101	3
BIOL 212	3 AN S 214	3

BIOL 212L	1 AN S 214L	1
CHEM 178	3 CHEM 331	3
ECON 101	3 CHEM 331L	1
Ethics - elective list	3 ENGL 250	3
	Free elective	3

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**17 18**

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AN S 319	3 AN S 320	3
AN S 331	3 AN S 352	3
GEN 320 or BIOL 313	3 AN S 337	3
CHEM 332	3 BBMB 301, 316, 404, or 420	3
MICRO 201 or 302	2-3 US diversity - elective list	3
MICRO 201L or 302L	1	
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<b>15-16</b>		<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
AN S 411	1 AN S 435	3
AN S 434	3 International Perspective - elective list	3
AN S elective	3 AN S elective	3
PHYS 131	4 Free elective	3
PHYS 131L	1 Free elective	4
Free elective	4	
<hr/>		
<b>16</b>		<b>16</b>

\* Credits currently required for application to Veterinary Medicine program at ISU (55 credits)

General Chemistry with lab (7)

Organic Chemistry with lab (4)

Biochemistry (3)

General Physics with lab (4)

General Biology with lab (8)

Genetics/Animal Breeding (3)

Mammalian Anatomy and/or Physiology (3)

English Composition (6)

Oral Communication (3)

Humanities and/or Social Science (8)

Other Electives (8)

## Diet and Exercise (AGLS)

### OVERVIEW

#### Diet and Exercise, B.S./M.S.

Administered by the Department of Food Science and Human Nutrition and Department of Kinesiology.

This is an accelerated program with concurrent enrollment in the undergraduate and graduate degree programs. Courses included have been approved as meeting the academic requirements of the Didactic Program in Dietetics (DPD) in preparation for admission to accredited dietetics internship programs; the DPD is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. There is a \$30 fee for the verification statement of completion of the accredited dietetics program. Additionally, courses are included to meet the American College of Sports Medicine (ACSM) requirements for certification at the level of Certified Exercise Physiologist.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Diet & Exercise major.

## Degree Requirements

**Total Degree Requirements: 120 cr. for bachelor's degree and 36-40 cr. for master's degree**

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements.

### Communications and Library: 10 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1



SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

**Social Sciences: 6 cr.**

PSYCH 101	Introduction to Psychology	3
KIN 366	Exercise Psychology	3
<b>Total Credits</b>		<b>6</b>

**Mathematical Sciences: 6-8 cr.**

Select at least 3 credits from: 3-4

MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
STAT 226	Introduction to Business Statistics I	
<b>Total Credits</b>		<b>6-8</b>

**Physical Sciences: 13 cr.**

Select from: 5

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
PHYS 115	Physics for the Life Sciences	4
or PHYS 131	General Physics I	
<b>Total Credits</b>		<b>13</b>

**Biological Sciences: 13 cr.**

BBMB 301	Survey of Biochemistry	3
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
BIOL 256	Fundamentals of Human Physiology	3
BIOL 256L	Fundamentals of Human Physiology Laboratory	1
MICRO 201	Introduction to Microbiology	2
<b>Total Credits</b>		<b>13</b>

**Diet and Exercise undergraduate courses to be completed or in progress when applying for admission to the program: 21-23 cr.**

Select from: 1-2

FS HN 110	Professional and Educational Preparation	
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or KIN 252 & KIN 253	Introduction to the Discipline of Kinesiology and Orientation and Learning Community in Kinesiology and Health	
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 214	Scientific Study of Food	3
FS HN 215	Advanced Food Preparation Laboratory	1-2
or FS HN 115	Food Preparation Laboratory	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 340	Foundations of Dietetic Practice	2
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
H S 110	Personal and Consumer Health	3
KIN 258	Principles of Physical Fitness and Conditioning	2
<b>Total Credits</b>		<b>21-23</b>

**Acceptance into the BS/MS PROGRAM is required BEFORE spring semester of the THIRD year.****Humanities and Ethics: 6-9 cr.**

Select 6 credits from approved Humanities list 6

Select 3 credits from approved Ethics list 3

Note: If ethics course is on the humanities list, it can meet both requirements.

**Diet and Exercise remaining undergraduate courses to complete the bachelor's degree requirements: 42 cr.**

H S 380	Worksite Health Promotion	3
A TR 220	Basic Athletic Training	2
or H S 305	Instructor's First Aid and Cardiopulmonary Resuscitation	
KIN 259	Leadership Techniques for Fitness Programs	3
KIN 345	Management of Health-Fitness Programs and Facilities	3
or FS HN 392	Food and Nutrition Services Management	
KIN 358	Exercise Physiology	3
KIN 359	Exercise Physiology Lab	1
Select two from:		6
KIN 355	Biomechanics	
KIN 360	Sociology of Physical Activity and Health	
KIN 372	Motor Control and Learning Across the Lifespan	
KIN 458	Principles of Fitness Assessment and Exercise Prescription	
KIN 462	Medical Aspects of Exercise	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 367	Medical Terminology for Health Professionals	1
FS HN 430	U.S. Health Systems and Policy	2

FS HN 466	Nutrition Counseling and Education Methods	3
HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
NUTRS 563	Community Nutrition and Health *	3
<b>Total Credits</b>		<b>42</b>

**Diet and Exercise graduate courses to complete the master's degree requirements: 36-40 cr.**

FS HN 581	Seminar **	1
FS HN 590C	Special Topics: Teaching **	1
FS HN 681	Seminar **	1
FS HN 682	Seminar Reflection **	R
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4
NUTRS 561	Medical Nutrition and Disease I	4
NUTRS 563	Community Nutrition and Health *	3
NUTRS 564	Medical Nutrition and Disease II *	4
KIN 501	Research Methods in Physical Activity	3
KIN 505	Research Laboratory Techniques in Exercise Physiology	3
KIN 550	Advanced Physiology of Exercise I	3
or KIN 551	Advanced Physiology of Exercise II	
STAT 587	Statistical Methods for Research Workers	4
Select 3-6 additional credits (FSHN students select 3 credits, KIN students select 6 credits) from:		3-6
KIN 550	Advanced Physiology of Exercise I	
KIN 551	Advanced Physiology of Exercise II	
KIN 567	Exercise and Health: Behavior Change	
KIN 570	Physical Activity Assessment for Health Related Research	
Select 2-3 credits for creative component or 6 credits for thesis research:		2-6
FS HN 599	Creative Component	
KIN 599	Creative Component	
KIN 699	Research	
NUTRS 699	Research in Nutritional Sciences	

\* Course counts toward both bachelor's and master's degrees.

\*\* Requirement for students in the FS HN Department.

Go to FS HN courses.

Go to KIN courses.

**Diet and Exercise, B.S./M.S.**

**First Year**

Fall	Credits	Spring	Credits
FS HN 110	1-2	ENGL 250	3
or KIN 252			
and KIN 253			
CHEM 163	4	FS HN 167	3
or 177			
CHEM 163L	1	H S 110	3
or 177L			
ENGL 150	3	KIN 258	2
LIB 160	1	STAT 101, 104, or 226	3-4
MATH 140, 143, 160, or 165	3-4		
PSYCH 101	3		

**16-18**

**14-15**

**Second Year**

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 255	3	BBMB 301	3	SP CM 212	3
BIOL 255L	1	BIOL 256	3	U.S. Diversity	3
CHEM 231	3	BIOL 256L	1		
CHEM 231L	1	FS HN 265	3		
KIN 259	3	FS HN 214	3		
A TR 220 or H S 305	2	FS HN 115 or 215	1-2		
MICRO 201	2	HSP M 133	1		
<b>15</b>		<b>15-16</b>		<b>6</b>	

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
FS HN 340	2	Acceptance into the program required before spring of the third year		KIN 599, FS HN 599, KIN 699, or NUTRS 699	1-3
FS HN 360	3	FS HN 361	2	STAT 587	4
KIN 358	3	FS HN 367	1		
KIN 359	1	HSP M 380	3		

Select from:	3 HSP M 380L	3		
KIN 360 or 372	KIN 366	3		
PHYS 115 or 131	4 Select from:	3		
Apply for admission to the BS/MS program by Oct. 1	KIN 355 or 458			
	<b>16</b>	<b>15</b>	<b>5-7</b>	

**Fourth Year**

Fall	Credits	Spring	Credits	Summer	Credits
KIN 505		3 NUTRS 564		4 KIN 599, FS HN 599, KIN 699, or FS HN 699	1-3
KIN 550, 551, 567, or 570		3 KIN 501		3	
FS HN 430		2 KIN 551		3	
FS HN 682 (FS HN Dept)		R KIN 462		3	
NUTRS 561		4 FS HN 581 (FS HN Dept)		1	
NUTRS 563 (Time conflict with NUTRS 501 next fall)		3 FS HN 682 (FS HN Dept)		R	
	<b>15</b>	<b>14</b>	<b>1-3</b>		

**Fifth Year**

Fall	Credits	Spring	Credits
NUTRS 501		4 KIN 345 or FS HN 392	3
FS HN 682 (FS HN Dept)		R KIN 699, NUTRS 699, KIN 599, or FS HN 599	2

Additional:	3 FS HN 466	3
KIN 550, KIN 551, KIN 567, or KIN 570		
H S 380	3 FS HN 590C (FS HN Dept)	1
Humanities/Ethics course	3 FS HN 681 (FS HN Dept)	1
	Humanities/International Perspectives	3
	<b>13</b>	<b>13</b>

Planned course offerings may change, and students need to check the online Schedule of Classes each term to confirm course offerings: <http://classes.iastate.edu/>. This sequence is only an example.

## Dietetics (AGLS)

Dietitians are nutrition experts who strive for optimal health and nutrition of individuals and the population. The curriculum for the dietetics program as well as the diet and exercise program meet the academic requirements of the Didactic Program in Dietetics and prepares students for a career in the field of dietetics. The program is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency for the Academy of Nutrition and Dietetics.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Dietetics major.

**Administered by the Department of Food Science and Human Nutrition**

The dietetics undergraduate curriculum meets the academic requirements as the Didactic Program in Dietetics and is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. Graduates of the program are eligible to apply for admission to accredited supervised practice programs/dietetics internships. There is a \$30 fee for the verification statement of completion of the accredited dietetics program.

**Total Degree Requirement: 120 cr.**

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

**International Perspectives: 3 cr.****U.S. Diversity: 3 cr.****Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

**Humanities and Social Sciences: 6-12 cr.**

Select Humanities course from approved list	3
PSYCH 101      Introduction to Psychology	3
If H Sci student, select:	6
Additional Humanities course	
Additional Humanities or Social Science course	

**Ethics: 3 cr.**

FS HN 342	World Food Issues: Past and Present	3
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**Mathematical Sciences: 6-8 cr.**

Select at least 3 credits from:		3-4
MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>6-8</b>

**Physical Sciences: 9 cr.**

Select from:		5
CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
<b>Total Credits</b>		<b>9</b>

**Biological Sciences: 17-18 cr.**

BBMB 301	Survey of Biochemistry	3
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
Select at least 3 credits from:		3-4
BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	
BIOL 335	Principles of Human and Other Animal Physiology	
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1
Total Credits		17-18

**Food Science and Human Nutrition: 44-45 cr.**

FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 214	Scientific Study of Food	3
FS HN 215	Advanced Food Preparation Laboratory	1-2
or FS HN 115	Food Preparation Laboratory	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 340	Foundations of Dietetic Practice	2
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 367	Medical Terminology for Health Professionals	1
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 430	U.S. Health Systems and Policy	2
FS HN 445	Strategies for Personal Food Waste Reduction	1
FS HN 461	Medical Nutrition and Disease I	4
FS HN 463	Community Nutrition and Health	3
FS HN 464	Medical Nutrition and Disease II	4
FS HN 466	Nutrition Counseling and Education Methods	3

COMST 450B	Special Topics in Communication Studies: Health Communication	3
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**Total Credits 44-45**

#### Management: 10 cr.

HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
FS HN 392	Food and Nutrition Services Management	3

**Total Credits 10**

**Electives: 0-15 cr. Select from any university coursework to earn at least 120 total credits.**

Go to FS HN courses.

## Dietetics, B.S.

### First Year

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 167	3
CHEM 163 or 177	4 BIOL 212	3
CHEM 163L or 177L	1 BIOL 212L	1
MATH 140, 143, 160, or 165	3-4 HSP M 133	1
ENGL 150	3 PSYCH 101	3
LIB 160	1 Humanities/Social Sci. (H Sci) or Elective (AgLS) course	3
Humanities	3	
<b>16-17</b>		<b>14</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 231	3 FS HN 265	3
CHEM 231L	1 BBMB 301	3
BIOL 255	3 BIOL 256 and 256L, or BIOL 335	3-4
BIOL 255L	1 MICRO 201	2
ENGL 250	3 MICRO 201L	1
STAT 101 or 104	3-4 Humanities course (H Sci) or Elective* (AgLS)	3
<b>14-15</b>		<b>15-16</b>

### Third Year

Fall	Credits Spring	Credits
FS HN 340	2 FS HN 361	2
FS HN 360	3 FS HN 362	3
FS HN 214	3 FS HN 367	1
FS HN 215 or 115	1-2 HSP M 380	3

SP CM 212	3 HSP M 380L	3
FS HN 342	3 COMST 450B	3

**15-16 15**

### Fourth Year

Fall	Credits Spring	Credits
FS HN 461	4 FS HN 464	4
FS HN 463	3 FS HN 445	1
FS HN 411	2 FS HN 430	2
FS HN 466	3 FS HN 392	3
U.S. Diversity	3 Electives *	6
<b>15</b>		<b>16</b>

### Footnotes

\* Choose elective courses to total equal to or greater than 120 credits.

Note: This sequence is only an example, and the number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on minors offered through Food Science and Human Nutrition can be found here: <http://catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Professional Practice in Dietetics (M.P.P.). More information on the program can be found here: <http://catalog.iastate.edu/collegeofhumansciences/professionalpracticeindietetics/>.

## Entomology Undergraduate Minors

All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

### Minor - Insect Science

The department offers a minor in Insect Science that may be earned by completing ENT 370 Insect Biology and 12 credits in courses selected from an approved list supplied by the department.

### Minor - Global Health

The Global Health minor is a transdisciplinary program designed for students who seek a broad and flexible set of skills for understanding

contemporary health challenges and broad-based thinking in finding solutions. Humans are at the core of Global Health, which is viewed and addressed through an understanding of disease, disease transmission, health and well-being. Global health incorporates all cultures and places and integrates knowledge of health's social, anthropological, historical, biological, and ecological dimensions. The program cultivates capacities to deal with complex problems across disciplines and social constructs: how to identify the critical issues, ask the right questions, and create solutions that are meaningful, lasting and effective.

### Requirements of the Global Health minor

The Global Health minor will consist of selecting courses that have at their core a focus on health, disease transmission, and social aspects that pertain to health. The minor will require a minimum of 15 credit hours with all students required to take Global Health (V MPM/MICRO/GLOBE 360) and Insects and Our Health (ENT/MICRO 374). The remaining credits to fulfill the minor will come from courses listed in two tracks:

- 1. Biological sciences of health
- 2. Social sciences aspects of health

Students must select a minimum of three credits from each of the two tracks, and an additional three credits from either track. Students may petition to take courses not on the approved list, providing these courses can be shown to include substantial study related to global health

Required for Global Health minor:

V MPM 360	Global Health (F)	3
ENT 374	Insects and Our Health (S)	3

Biological Science track:

BIOL 328	Molecular and Cellular Biology of Human Diseases (F)	3
ENT 374L	Insects and Our Health Laboratory (Alt. S)	1
FS HN 460	Global Nutrition and Health	3
H S 350	Human Diseases (F, S, SS)	3
MICRO 310	Medical Microbiology (F)	3
MICRO 408	Virology	3
V PTH 353	Introductory Parasitology (S)	3
VDPAM 428	Principles of Epidemiology and Population Health (S)	3

Social Science track:

AGRON 342	World Food Issues: Past and Present	3
ECON 385	Economic Development	3
FS HN 442	Issues in Food and Society	2
GLOBE 330	Global Health Disparities	3
H S 310	Community and Public Health	3
SOC 345	Population and Society (F)	3

SOC 348	Global Poverty, Resources and Sustainable Development	3
SOC 411	Social Change in Developing Countries (S)	3

## Graduate Study

The department offers work for the master of science and doctor of philosophy degrees with a major in entomology. Studies at the Ecosystem, Organismal, and Subcellular levels occur in the following areas: aquatic entomology, biological control, chemical ecology, ecology, host plant resistance, insecticide toxicology, medical/veterinary entomology, pathology, pest management, physiology, population genetics, or systematics.

Graduates have a broad understanding of entomology and related disciplines, and an in-depth command of their area of concentration. They are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings. Graduates are able to address complex problems facing entomology or toxicology professionals, taking into account related ethical, social, legal, economic, and environmental issues. They are skilled in research methods, data analyses, and interpretation of results. They also are skilled in working effectively with their colleagues, and writing concise and persuasive grant proposals. They have an understanding of and can critically evaluate current entomological literature.

Prerequisite to the entomology major and to minor graduate work in the department is completion of at least two years of zoological courses, for part of which credit in other closely allied biological sciences may be substituted. Specific course requirements for advanced degrees depend partly upon previous training and experience in the major field of specialization.

Any student receiving the M.S. in entomology shall have at least one course in insect physiology, one course in insect systematics, two courses of ENT 590 Special Topics (selected from topics A through D, F through I, M and N, inclusive), and at least 1 credit of ENT 600 Seminar.

Any student receiving the Ph.D. in entomology shall have at least one course in insect physiology, one course in insect systematics, four additional courses of ENT 590 Special Topics (selected from topics A through D and F through I, M through N inclusive), and at least 1 credit of ENT 600 Seminar. At least one 590 must be taken from each of these subgroups: Population (C, D, N); Organismal (A, B, F, M); and Suborganismal (G, I).

In addition, Ph.D. students majoring either in Entomology or Toxicology shall have two semesters of teaching experience, taken as ENT 590K Special Topics: Teaching Experience. both semesters or ENT 590K Special Topics: Teaching Experience. one semester and ENT 590L Special Topics: Extension Internship. the other semester.



A student can receive a Ph.D. minor in Entomology by taking 3 Entomology courses (500 level and above) for a total of 9 credits to be determined by the student's POS committee and approved by the Entomology Director of Graduate Education.

An option for an emphasis in molecular Entomology is available. Any student receiving the M.S. in entomology with an emphasis in molecular entomology is required to take:

ENT 555	Insect Physiology	4
ENT 590G	Special Topics: Molecular Entomology.	1-3
Plus one other course of 590 selected from topics A-D, F, H, I, M, N		
Plus one additional course in molecular entomology		
ENT 600	Seminar	1
BBMB 404	Biochemistry I	3
BBMB 542A	Introduction to Molecular Biology Techniques: DNA Techniques	1
And one course from the following:		
ENT 576	Systematic Entomology	
ENT 525	Aquatic Insects	
ENT 568	Advanced Systematics	

Any student receiving the Ph.D. in entomology with an emphasis in molecular entomology is required to take:

ENT 555	Insect Physiology	4
ENT 590G	Special Topics: Molecular Entomology.	1-3
Plus three other courses of 590 selected from topics A-D, F, H, I, M, N		
One additional course in molecular entomology		
ENT 600	Seminar	1
BBMB 542A	Introduction to Molecular Biology Techniques: DNA Techniques	1
Plus two other workshops selected from:		
BBMB 542C	Introduction to Molecular Biology Techniques: Cell Techniques	
BBMB 542D	Introduction to Molecular Biology Techniques: Plant Transformation	
BBMB 542E	Introduction to Molecular Biology Techniques: Proteomics	
An additional course with a molecular component		
Plus one from each of the following:		
Systematics		
ENT 576	Systematic Entomology	3
ENT 525	Aquatic Insects	
ENT 568	Advanced Systematics	
Biochemistry		

BBMB 404	Biochemistry I
BBMB 405	Biochemistry II
BBMB 504	Amino Acids and Proteins
BBMB 505	Bioenergetics and Metabolism

Entomology faculty participate in the interdepartmental majors in ecology and evolutionary biology; genetics; microbiology; molecular, cellular and developmental biology; sustainable agriculture; and in the interdepartmental major and minor in toxicology (see Index).

The Federal Corn Insects and Crop Genetics Research Unit is available for advanced study in certain phases of entomological research.

More information about the department, such as current research, faculty resumes, physical facilities, and graduate students can be viewed on the department's website at [www.ppem.iastate.edu](http://www.ppem.iastate.edu) (<http://www.ent.iastate.edu>).

#### Courses primarily for undergraduates:

##### ENT 201: Introduction to Insects

(2.7-0) Cr. 1. F.S.SS.

Biological and ecological aspects of insects. Offered online only. 5 weeks.

##### ENT 211: Insects and Society

(2.7-0) Cr. 2. F.S.

*Prereq:* ENT 201

The importance of insects in human well-being. Insect-human interactions. Primarily for non-science and non-agriculture majors. Offered online only. 11 weeks.

##### ENT 214: Insects in Forensic Science

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to the use of insects as evidence in court and how they can assist in solving crimes. Topics covered include basic insect biology, systematics, behavior, with emphasis on applications of forensic entomology.

##### ENT 220: Introduction to Forensic Science

(Cross-listed with C J). (3-0) Cr. 3. S.

Study of fundamental forensic science techniques and procedures covering types of physical, chemical, and biological evidence and how this information is used in the legal system. Assessment of crime scenes and various forensic specialties will be introduced.

**ENT 283: Pesticide Application Certification**

(Cross-listed with AGRON, FOR, HORT). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**ENT 358: Bee Biology, Management, and Beekeeping**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq: 1 course in 200-level BIOL or Permission of Instructor*

Bee diversity and evolution, ecology, role as pollinators, behavior, anatomy, and development. Management of bees as agricultural pollinators and honey producers, focusing on honey bees. Working with live bee hives and demonstration of practical beekeeping skills will occur during several field trips to local hives.

**ENT 370: Insect Biology**

(2-3) Cr. 3. F.

*Prereq: BIOL 101 or BIOL 211*

Structure, physiology, evolution, behavior, life histories, and recognition of insects. Collection required.

**ENT 372: Livestock Entomology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

Classroom and off-campus videotape sections. 12 weeks. Recognition, biology, behavior, economic importance, and management of insects and other arthropods affecting livestock and poultry production.

**ENT 374: Insects and Our Health**

(Cross-listed with MICRO). (3-0) Cr. 3. S.

*Prereq: 3 credits in BIOL*

Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease.

Meets International Perspectives Requirement.

**ENT 374L: Insects and Our Health Laboratory**

(Cross-listed with MICRO). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Credit or concurrent enrollment in ENT 374 or MICRO 374*

Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**ENT 375: Plant Protection Using Natural Enemies**

(Dual-listed with ENT 575). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENT 370 or ENT 376*

Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies.

**ENT 376: Fundamentals of Entomology and Pest Management**

(2-3) Cr. 3. S.

*Prereq: BIOL 101 or BIOL 211*

Introduction to entomology and insect-pest management, including life processes, ecology, economics, tactics of population suppression, and ecological backlash.

**ENT 425: Aquatic Insects**

(Dual-listed with ENT 525). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 435: Entomology Field Trip**

(Cross-listed with A ECL). Cr. 2. Repeatable, maximum of 2 times. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: BIO 312; Permission of Instructor*

Field trip to study insects of major terrestrial and aquatic ecosystems. Location and duration vary. ENT 370 or ENT 425 recommended.

**ENT 450: Pesticides in the Environment**

(Dual-listed with ENT 550). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENT 452: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with ENT 552). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 471: Insect Ecology**

(Dual-listed with ENT 571). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 211 or Permission of Instructor*

The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

A maximum of 9 credits of all (university-wide) 490 credits may be applied toward graduation.

**ENT 490E: Independent Study: Research or work experience.**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

A maximum of 9 of all (university-wide) 490 credits may be used toward graduation.

**ENT 490U: Independent Study: Laboratory teaching experience**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

For students registering to be undergraduate laboratory assistants. A maximum of 9 of all (university-wide) 490 credits may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ENT 511: Integrated Management of Tropical Crops**

(Cross-listed with HORT, PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects.

Meets International Perspectives Requirement.

**ENT 525: Aquatic Insects**

(Dual-listed with ENT 425). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, PL P, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**ENT 550: Pesticides in the Environment**

(Dual-listed with ENT 450). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENT 552: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with ENT 452). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 555: Insect Physiology**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq: ENT 370*

Life processes of the insects, including reviews of current problems in insect physiology.

**ENT 568: Advanced Systematics**

(Cross-listed with EEOB). (2-3) Cr. 3. Alt. S., offered irregularly.

*Prereq: Permission of instructor*

Principles and practice of systematic biology; taxonomy, nomenclature and classification of plants and animals; sources and interpretation of systematic data; speciation; fundamentals of phylogenetic systematics.

**ENT 570: Plant-Insect Interaction**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in biological sciences*

Physiological, behavioral, ecological, and evolutionary factors that govern interactions between insects and plants, applications of this knowledge to agriculture, and important results from the study of natural systems. Additional topics covered during the semester include: tritrophic interactions, biological control of plants by insects, and pollination biology. Student-led discussions and draws on both the primary and secondary literature.

**ENT 571: Insect Ecology**

(Dual-listed with ENT 471). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 211 or Permission of Instructor*

The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 574: Medical Entomology**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq: 9 credits in biological sciences*

Identification, biology, and significance of insects and other arthropods that attack people and animals, particularly those that are vectors of disease.

**ENT 575: Plant Protection Using Natural Enemies**

(Dual-listed with ENT 375). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENT 370 or ENT 376*

Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies.

**ENT 576: Systematic Entomology**

(3-6) Cr. 5. Alt. F., offered even-numbered years.

*Prereq: ENT 370*

Classification, distribution, and natural history of insects, including fundamentals of phylogenetic systematics, biogeography, taxonomic procedures, and insect collection and curation.

**ENT 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with AGRON, HORT, PL P). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**ENT 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: 15 credits in biological sciences.*

**ENT 590A: Special Topics: Biological Control and Pathology.**

Cr. 1-3. Repeatable.

**ENT 590B: Special Topics: Chemical Ecology and Behavior.**

Cr. 1-3. Repeatable.

**ENT 590C: Special Topics: Ecology and Pest Management.**

Cr. 1-3. Repeatable.

**ENT 590D: Special Topics: Evolution and Systematics.**

Cr. 1-3. Repeatable.

**ENT 590E: Special Topics: Special Research Topics.**

Cr. 1-3. Repeatable.

**ENT 590F: Special Topics: Medical and Veterinary Entomology.**

Cr. 1-3. Repeatable.

**ENT 590G: Special Topics: Molecular Entomology.**

Cr. 1-3. Repeatable.

**ENT 590I: Special Topics: Toxicology**

Cr. 1-3. Repeatable.

**ENT 590K: Special Topics: Teaching Experience.**

Cr. 1-3. Repeatable.

**ENT 590L: Special Topics: Extension Internship.**

Cr. 1-3. Repeatable.

**ENT 590M: Special Topics: Immature Insects.**

Cr. 1-3. Repeatable.

**ENT 590N: Special Topics: Population Genetics.**

Cr. 1-3. Repeatable.

**Courses for graduate students:****ENT 600: Seminar**

Cr. 1. F.S.SS.

Presentation of research results.

ENT 675: Insecticide Toxicology

(Cross-listed with TOX). (2-3) Cr. 3. Alt. F., offered even-numbered years.

Prereq: ENT 555 or TOX 501

Principles of insecticide toxicology; classification, mode of action, metabolism, and environmental effects of insecticides.

ENT 699: Research

Cr. arr. Repeatable.

Environmental Science  
Interdepartmental Undergraduate  
Programs

Environmental Science provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems. The magnitude and complexity of environmental problems are creating a growing need for scientists with rigorous, interdisciplinary training in environmental science. The Environmental Science program is designed to prepare students for positions of leadership in this rapidly changing discipline. Environmental Science graduates have a solid foundation in biological and physical natural sciences and the specialized training necessary for integrated analysis of environmental systems.

Undergraduate Study

The Environmental Science undergraduate major is offered through both the College of Agriculture and Life Sciences and the College of Liberal Arts and Sciences. Environmental Science majors complete foundation courses in natural sciences and mathematics, plus a major consisting of an integrated core of Environmental Science courses and additional advanced course work in Environmental Science. Scientific rigor is stressed throughout the program, beginning with the foundation courses in the first two years of the curriculum. The upper level core courses emphasize a dynamic systems approach that provides a framework for integrating physical, chemical, and biological aspects of environmental systems. Beyond the required core, students select from a broad array of advanced courses to either develop greater breadth, or specialization in areas including, but not limited to, water resources, climate impacts and adaptation, environmental restoration and management, and geographic information systems (see <https://www.ensci.iastate.edu/> for additional information on areas of specialization).

Student Learning Outcomes

Upon graduation, students should be able to:

Demonstrate a broad understanding of environmental systems and issues utilizing an interdisciplinary framework to integrate ideas and concepts from biological and physical natural sciences

Demonstrate proficiency in data analysis and problem-solving of relevant environmental systems/problems

Use a systems approach to conduct integrated, quantitative, and interdisciplinary analyses and modeling of environmental systems and problems

College of Agriculture and Life Sciences

Students seeking an Environmental Science major complete the following:

- 1. A foundation of approved supporting courses in science and mathematics including biology, chemistry, earth science, physics, mathematics, and statistics.
- 2. 33 credits of course work in the major, including a required core of 20 credits.

A combined average grade of C or higher is required in courses applied in the major.

1. Environmental Science: 33 credits

ENSCI 110	Orientation to Environmental Science	1
ENSCI 201	Introduction to Environmental Issues	2
ENSCI 202	Exploration of Environmental and Sustainability Issues	1
ENSCI 203	Exploration of Environmental Science	1
ENSCI 250	Environmental Geography	3
ENSCI 251	Biological Processes in the Environment	3
ENSCI 312	Ecology	4
ENSCI 318	Introduction to Ecosystems	3
ENSCI 319	Analysis of Environmental Systems	3
Additional ENSCI choice courses		12
Total Credits		33

2. Mathematics & Statistics: 6-8 credits

Choose one of the following:		3-4
MATH 104	Introduction to Probability	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 151	Calculus for Business and Social Sciences	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
COM S 106	Introduction to Web Programming	
COM S 107	Windows Application Programming	
DS 201	Introduction to Data Science	
DS 202	Data Acquisition and Exploratory Data Analysis	
Choose one of the following:		3-4
STAT 101	Principles of Statistics	

STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>6-8</b>
<b>3. Physical &amp; Life Sciences: 21-24 credits</b>		
BIOL 211	Principles of Biology I	3
Choose from one of the following:		5
CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
CHEM 167 & 167L	General Chemistry for Engineering Students and Laboratory in General Chemistry for Engineering	
CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 201 & 201L	Advanced General Chemistry and Laboratory in Advanced General Chemistry	
Choose from one of the following:		3-4
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	
BBMB 221	Structure and Reactions in Biochemical Processes	
AGRON 259	Organic Compounds in Plants and Soils	
Choose 3 of the following:		9
AGRON 182	Introduction to Soil Science	
AGRON 282	Soil Conservation and Land Use	
GEOL 100	How the Earth Works	
	or GEOL 201 Geology for Engineers and Environmental Scientists	
MTEOR 206	Introduction to Weather and Climate	
BIOL 212	Principles of Biology II	
CHEM 178 & 178L	General Chemistry II and Laboratory in College Chemistry II	
PHYS 115	Physics for the Life Sciences	
	or PHYS 131 General Physics I	
	or PHYS 231 Introduction to Classical Physics I	
<b>Total Credits</b>		<b>20-21</b>
<b>4. Communications: 7-10 credits</b>		
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research (Embedded communication coursework in ENSCI 203 and ENSCI 312)	1
Embedded communication coursework in ENSCI 203 and ENSCI 312		
<b>Total Credits</b>		<b>7</b>

### Additional communication courses required of majors in the College of Agriculture and Life Sciences

Choose one of the following:		3
SP CM 212	Fundamentals of Public Speaking	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
COMST 214	Professional Communication	
<b>Total Credits</b>		<b>3</b>
<b>5. General Education: 15-21 credits</b>		
<b>General Education requirements in the College of Agriculture and Life Sciences</b>		
Humanities		3
Social Science		3
Ethics		3
International Perspectives course from university approved list		3
US Diversity course from university approved list		3
<b>Total Credits</b>		<b>15</b>

### General Education requirements in the College of Liberal Arts and Sciences

Arts and Humanities courses from college approved list		12
Social Science courses from college approved list		9
(Select courses to include 3 cr. of International Perspectives and 3 cr. of US Diversity)		
Students must have completed 3 years of a single world language in high school or take 4-8 credits of World Languages at the university level		
<b>Total Credits</b>		<b>21</b>

### Electives (28-35 credits)

**LAS students must earn a minimum of 45 credits at the 300-/400-level.**

**A minimum of 120.0 Total Credits are needed for graduation**

Environmental Science, B.S. (AGLS)

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 ENSCI 203 <sup>1</sup>	1
ENSCI 110 <sup>1</sup>	1 BIOL 211	3
ENSCI 201 <sup>1</sup>	2 BIOL 211L	1
ENSCI 202 <sup>1</sup>	1 Physical or Life Science Choice <sup>3</sup>	3 or 4
CHEM 177	4 Social Science or Humanities Choice <sup>2</sup>	3
CHEM 177L	1 Mathematics, Programming, or Data Science choice	3-4
LIB 160	1	



STAT 101 or 104	3-4	
	<b>16-17</b>	<b>14-16</b>
<b>Sophomore</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENSCI 250 <sup>1</sup>	3 ENSCI 251	3
Social Science or Humanities Choice <sup>2</sup>	3 Organic Chemistry Choice <sup>3</sup>	3
ENGL 250	3 Social Science or Humanities Choice <sup>2</sup>	3
Physical or Life Science choice <sup>3</sup>	Physical or Life Science choice <sup>3</sup>	
Elective	3 Communications (Speech)	3
	<b>12</b>	<b>12</b>
<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENSCI 312	4 ENSCI 318	3
Environmental Science Choice <sup>1</sup>	3 ENSCI 319	3
Social Science or Humanities Choice <sup>2</sup>	3 Social Science or Humanities Choice <sup>2</sup>	3
Elective	6 Electives	6
	<b>16</b>	<b>15</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Environmental Science Choice <sup>1</sup>	3 Environmental Science Choice <sup>1</sup>	6
Elective	12 Elective	9
	<b>15</b>	<b>15</b>

<sup>1</sup> Students complete at least 32 credits in Environmental Science including ENSCI 110, ENSCI 201, ENSCI 202, ENSCI 203, ENSCI 250, ENSCI 251, ENSCI 312, ENSCI 318, ENSCI 319 and 15 additional credits of approved ENSCI coursework.

<sup>2</sup> Students complete at least 15 credits in humanities and social science including at least 3 credits each in ethics, humanities, social science, U.S. Diversity, and International Perspectives from approved lists.

<sup>3</sup> Students choose one course from the following Physical and Life Science related courses: AGRON 182, AGRON 282, BIOL 212, CHEM 178, GEOL 100, GEOL 201, MTEOR 206, PHYS 115, PHYS 131, PHYS 231. Students choose from one of the following Organic Chemistry options: CHEM 231 & CHEM 231L, CHEM 331 & CHEM 331L, BBMB 221, or AGRON 259.

### Lynette Edsall

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<https://enscigrad.iastate.edu/>

The Environmental Science graduate program offers an interdepartmental curriculum leading to M.S. and Ph.D. degrees with a major in Environmental Science. Faculty from the colleges of Agriculture and Life Sciences, Engineering, and Liberal Arts and Sciences cooperate to offer courses and research opportunities covering a broad array of environmental topics. Cooperating departments include Agricultural and Biosystems Engineering; Agronomy; Animal Science; Civil, Construction and Environmental Engineering; Ecology, Evolution and Organismal Biology; and Geological and Atmospheric Sciences.

Applicants should have completed an undergraduate or master's degree in one of the biological, chemical, physical, or engineering sciences or should have equivalent preparation.

The Environmental Science Graduate Program emphasizes fundamental concepts and research, which at the same time address major environmental issues. The curriculum is designed to provide the interdisciplinary approach needed in environmental science education and research. In addition to work in their chosen area of specialization, students are afforded a broad exposure to the biological, chemical and physical aspects of environmental systems and the specialized training necessary for integrated analysis of these systems.

Information on application procedures, curriculum requirements, and faculty research areas is available on the Environmental Science Graduate Program website (<https://enscigrad.iastate.edu/>).

## Food Science (AGLS)

Food science is a degree program focused on food issues from the time crops leave the field until consumers buy the food products. Food scientists apply basic science (chemistry, biology, physics) to improve processing, preservation, and safety of food and to develop new food products. The food science major is approved by the Institute of Food Technologists.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.

## Graduate Study

Contact information for the graduate program:

- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Food Science major.

The department also offers a food science minor.

#### Administered by the Department of Food Science and Human Nutrition

Courses listed below are required.

#### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

#### International Perspectives: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communications and Library: 10 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

#### Humanities and Social Sciences: 6-12 cr.

Select Humanities course from approved list	3	
ECON 101	Principles of Microeconomics	3
If H Sci student, select:	6	
Additional Humanities course		
Additional Humanities or Social Science course		

#### Ethics: 3 cr.

FS HN 342	World Food Issues: Past and Present	3
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#### Mathematical Sciences: 7-8 cr.

Select 4 credits from:

MATH 160	Survey of Calculus	4
or MATH 165	Calculus I	

Select at least 3 credits from:

STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	

<b>Total Credits</b>		<b>7-8</b>
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#### Physical Sciences: 17-19 cr.

CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	5
CHEM 178	General Chemistry II	3
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	4-6
or CHEM 331 & CHEM 332	Organic Chemistry I and Organic Chemistry II	
PHYS 115 & 115L	Physics for the Life Sciences and Laboratory in Physics for the Life Sciences	5
or PHYS 131 & 131L	General Physics I and General Physics I Laboratory	

<b>Total Credits</b>		<b>17-19</b>
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#### Biological Sciences: 10-11 cr.

BBMB 301	Survey of Biochemistry	3
or BBMB 303	General Biochemistry	
or BBMB 316	Principles of Biochemistry	
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
MICRO 201	Introduction to Microbiology	2-3
or MICRO 302	Biology of Microorganisms	
MICRO 201L	Introductory Microbiology Laboratory	1
or MICRO 302L	Microbiology Laboratory	

<b>Total Credits</b>		<b>10-11</b>
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#### Food Science and Human Nutrition: 49 cr.

FS HN 101	Food and the Consumer	3
FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	1
FS HN 207	Processing of Foods: Basic Principles and Applications	3
FS HN 305	Food Quality Management and Control	2
FS HN 311	Food Chemistry	3
FS HN 311L	Food Chemistry Laboratory	1
FS HN 314	Professional Development for Culinary Food Science and Food Science Majors	1
FS HN 315	Professional Skills for Culinary Food Science and Food Science Majors	1
FS HN 351	Introduction to Food Engineering Concepts	3
FS HN 403	Food Laws and Regulations	2
FS HN 406	Sensory Evaluation of Food	3
FS HN 407	Microbiological Safety of Foods of Animal Origins	3

FS HN 410	Food Analysis	3
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 412	Food Product Development	3
FS HN 420	Food Microbiology	3
FS HN 421	Food Microbiology Laboratory	3
FS HN 471	Food Processing	3
FS HN 472	Food Processing Laboratory	2
<b>Total Credits</b>		<b>49</b>

Select 5-6 credits from the following Professional Electives: 5-6

A B E 325	Biorenewable Systems
ACCT 215	Legal Environment of Business
ACCT 284	Financial Accounting
ACCT 285	Managerial Accounting
AESHM 474	Entrepreneurship in Human Sciences
AGRON 450	Issues in Sustainable Agriculture
AN S 270	Foods of Animal Origin
AN S 270L	Foods of Animal Origin Laboratory
AN S 360	Fresh Meat Science and Applied Muscle Biology
AN S 460	Science and Technology of Value Added Meat Products
CHEM 211	Quantitative and Environmental Analysis
CHEM 211L	Quantitative and Environmental Analysis Laboratory
CHEM 316	Instrumental Methods of Chemical Analysis
CHEM 316L	Instrumental Analysis Laboratory
ECON 235	Introduction to Agricultural Markets
ECON 301	Intermediate Microeconomics
ECON 320	Labor Economics
ECON 335	The Economics of Global Agricultural Food and Bio-energy
ECON 337	Agricultural Marketing
ECON 362	Applied Ethics in Agricultural Business
ECON 460	Agricultural, Food, and Trade Policy
ENTSP 310	Entrepreneurship and Innovation
FS HN 241	Introduction to Manufacturing Processes for Plastics
FS HN 242	The US Food System
FS HN 264	Fundamentals of Nutritional Biochemistry
FS HN 265	Nutrition for Active and Healthy Lifestyles
FS HN 276	Understanding Grape and Wine Science
FS HN 408	Dairy Products Evaluation
FS HN 435	Analysis of Food Markets

FS HN 442	Issues in Food and Society
FS HN 460	Global Nutrition and Health
FS HN 490B	Independent Study: Food Science
FS HN 491B	Supervised Work Experience: Food Science
FS HN 496	Food Science and Human Nutrition Travel Course
FS HN 499	Undergraduate Research
FS HN 509	Sensory Evaluation of Wines
GLOBE 201	Introduction to Global Resource Systems
GLOBE 220	Globalization and Sustainability
GLOBE 303	Agricultural, Food and Natural Global Resource Systems
HORT 221	Principles of Horticulture Science
HORT 461	Fruit Crop Production and Management
HORT 471	Vegetable Production and Management
HORT 471L	Vegetable Production and Management Lab
MGMT 371	Organizational Behavior
MGMT 414	International Management
MGMT 472	Diversity, Equity, and Inclusion in Organizations
MIS 301	Management Information Systems
MKT 340	Principles of Marketing
MKT 447	Consumer Behavior
MKT 448	Global Marketing

**Total Credits** 5-6

**Electives: 2-13 cr. Select from any university coursework to earn at least 120 total credits. Food science internship experience is strongly recommended during the summers, and students can earn elective credits for the internship experience by enrolling in FS HN 491B.**

Go to FS HN courses.

Food Science, B.S.

#### First Year

Fall	Credits Spring	Credits
FS HN 101	3 FS HN 167	3
FS HN 110	1 CHEM 178	3
CHEM 177	4 BIOL 212	3
CHEM 177L	1 BIOL 212L	1
ENGL 150	3 ECON 101	3
LIB 160	1 Humanities	3
Humanities or Elective	3	
<b>16</b>		<b>16</b>

#### Second Year

Fall	Credits Spring	Credits
CHEM 231 and CHEM 231L	3-4 BBMB 301, 303, or 316	3
or CHEM 331		

FS HN 203	1 CHEM 332 (if CHEM 331 taken) or Elective	3
ENGL 250	3 MICRO 201 or 302	2-3
PHYS 115 or 131	4 MICRO 201L or 302L	1
PHYS 115L or 131L	1 STAT 101 or 104	3-4
MATH 160 or 165	4 FS HN 207	3
<b>16-17</b>		<b>15-17</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
FS HN 311	3 FS HN 305	2
FS HN 311L	1 FS HN 351	3
FS HN 314	1 FS HN 403	2
FS HN 315	1 FS HN 411	2
FS HN 420	3 FS HN 421	3
SP CM 212	3 Professional Elective	3
Professional Elective	3	
<b>15</b>		<b>15</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
FS HN 406	3 FS HN 342	3
FS HN 410	3 FS HN 412	3
FS HN 471	3 FS HN 472	2
FS HN 407	3 U.S. Diversity (if not already taken) or elective	3
Elective*	2 Humanities/social science (H Sci) or elective (AgLS)	3
<b>14</b>		<b>14</b>

\* Choose elective courses to total equal to or greater than 120 credits.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point considerations.

More information on the Food Science, Food Safety, and Food and Society minors can be found here: <http://catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Food Science and Technology. More information can be found here: <https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=50>.

## Food Science and Human Nutrition

The Department of Food Science and Human Nutrition is jointly administered by the College of Agriculture and Life Sciences and the College of Human Sciences. All curricula offered by the department are available to students in either college. These majors include:

- Culinary food science
- Dietetics
- Diet and exercise
- Food science
- Nutritional science
- Nursing

Visit the department web site at: [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu) (<http://www.fshn.hs.iastate.edu>).

### Undergraduate Study

#### Culinary Food Science

Culinary food science is an interdisciplinary degree combining a strong food science foundation with acquisition of culinary skills. The program includes chemistry, organic chemistry, biology, microbiology, and biochemistry as well as quantity food production, fine dining management, and food safety and sanitation. Internship experience in the food industry or culinary business is required. Culinary food science graduates are qualified to work as managers and specialists in food research, product development, culinary applications, and food marketing and sales. For more information: <https://fshn.hs.iastate.edu/find-your-major/culinary-food-science/>

#### Dietetics

The Didactic Program in Dietetics (DPD) is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. The dietetics undergraduate curriculum meets the academic requirements as the DPD. Additionally, the curriculum for concurrent Bachelor's and Master's degrees in diet and exercise meets the academic requirements of the DPD. Graduates of the program are eligible to apply for admission to accredited dietetics internships/supervised practice programs. Upon successful completion of the experience program and a master's degree, graduates are eligible to take the national examination administered by the Commission on Dietetic Registration to become a Registered Dietitian Nutritionist (RDN) and to practice in the field of dietetics. There is a \$30 fee for a statement of verification of completion of the DPD. For information about verification statements policies, see the dietetics program website: <https://fshn.hs.iastate.edu/find-your-major/dietetics/>.

The dietetics program includes study in basic sciences, nutrition, and food science with applications to medical dietetics, nutrition counseling and education, and community nutrition. Foodservice management is

also an important aspect of the program. Graduates work in clinical settings, consulting, food companies, food services, sports or athletic programs, corporate wellness programs, care facilities for patients from neonatal to geriatric, and community or school health programs.

### **Diet and Exercise**

A program for concurrent Bachelor of Science and Master of Science (BS/MS) degrees in diet and exercise (<https://fshn.hs.iastate.edu/find-your-major/diet-and-exercise/>) is available. The program is jointly administered by the Department of Food Science and Human Nutrition (FS HN), within the College of Agriculture and Life Sciences and College of Human Sciences, and the Department of Kinesiology within the College of Human Sciences. Students interested in this program enroll as pre-diet and exercise students. In the fall of the third year, students apply for admission to the BS/MS program. Students not accepted into the program can continue toward completion of the BS degree in dietetics or kinesiology and health. Coursework has been designed to facilitate a 4-year graduation date for those students not accepted into the program and electing to complete a single undergraduate degree. Students accepted into the program will progress toward completion of BS/MS degrees in diet and exercise.

### **Food Science**

Food science is a discipline in which the principles of biological and physical sciences are used to study the nature of foods, the causes of their deterioration, and the principles underlying the processing and preparation of food. It is the application of science and technology to the provision of a safe, wholesome, and nutritious food supply. Biotechnology and toxicology interrelate with food science in the area of food safety. In the food industry, food scientists work in research and development of products or processes, production supervision, quality control, marketing and sales, test kitchens and recipe development, product promotion and communication. Food scientists also work in government regulatory agencies and academic institutions.

The food science major is approved by the Institute of Food Technologists, the national professional organization of food science. Career options include quality control/assurance; production supervision; management and sales; research careers in the food industry, government, or academia; business; journalism; food product formulation and recipe development; food promotion and communication; and consumer services in government and industry. For more information: <https://fshn.hs.iastate.edu/find-your-major/food-science/>

Students in food science have the opportunity to pursue a Master of Business Administration (<http://www.fshn.hs.iastate.edu/undergraduate-programs/food-science/>) (MBA) concurrently with the Bachelor of Science (BS) degree in food science. The program is designed so students can earn both the BS in food science and MBA in five years, to meet the needs of students who are interested in management careers

in the food industry. Students apply for admission to the MBA program in the spring of the third year. The program for concurrent BS in food science/MBA degrees is a rigorous 5-year program, and admission is very selective.

### **Nutritional Science**

Nutritional science looks at the connection between diet and health. Students learn how diet can play a crucial role in the cause, treatment, and prevention of many diseases. There are degree program focuses within nutritional science. The pre-health and research coursework prepares students for work in research laboratories, graduate study in nutrition or biological sciences, or entrance into health professional programs, such as medical, dental, physician assistant, and pharmacy schools. Students gain a strong science education along with human nutrition expertise. The health coach and nutrition and wellness coursework prepares students for work positions in program planning and evaluation for community, public health, non-profit, and corporate wellness programs addressing the growing public interest in nutrition, wellness, and preventative health. Students learn about the role of nutrition and healthy eating for disease prevention and wellness. For more information: <https://fshn.hs.iastate.edu/find-your-major/nutritional-science/>

### **Nursing**

The Bachelor of Science in Nursing (BSN) program at Iowa State University is a RN-to-BSN program, designed for those who are already a Registered Nurse (RN), and desire to further their nursing career and education to the next level. Iowa State's RN-to-BSN program provides interactive learning opportunities where students can apply their real-world experiences and education to inspire innovation in their places of care. RN-to-BSN students will be challenged to enhance health promotion and disease prevention, apply nursing science and evidenced-based patient-centered care, focus on the culture of health for nurses, individuals, and communities, and demonstrate the continuum of care, from a nurse's self-care to patient care to community and population health.

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is approved by the:

#### **Iowa Board of Nursing (IBON)**

Riverpoint Business Park  
400 SW 8th St., Suite B  
Des Moines, IA 50309  
(515) 281-3255

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is accredited by the:

#### **Accreditation Commission for Education in Nursing (ACEN)**

3390 Peachtree Road NE, Suite 1400

Atlanta, GA 30326  
(404) 975-5000

The most recent accreditation decision made by the ACEN Board of Commissioners for the baccalaureate nursing program is initial accreditation.

View the public information disclosed by the ACEN regarding this program at <http://www.acenursing.com/accreditedprograms/programSearch.htm>

For more information and RN-to-BSN learning outcomes: <https://fshn.hs.iastate.edu/find-your-major/nursing/>

## FS HN Departmental Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes.

For more information: <https://fshn.hs.iastate.edu/staff-and-faculty/resources/outcomes-assessment/learning-outcomes/>.

Communication Proficiency is certified by a grade of C or better in 6 credits of coursework in composition (ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition or other communication-intensive courses) and a grade of C or better in 3 credits of coursework in oral communication.

## Minors - Undergraduate

The department offers minors in:

- culinary food science
- food and society
- food safety (interdepartmental minor)
- food science
- nutrition

All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The

minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

**Prerequisites:** Students must complete prerequisite requirements for courses included in the minor.

### Minor in Culinary Food Science

FS HN 101	Food and the Consumer	3
FS HN 115	Food Preparation Laboratory	1-2
or FS HN 215	Advanced Food Preparation Laboratory	
FS HN 214	Scientific Study of Food	3
Select additional credits from the following list for a minimum of 15 credits for the minor:		
FS HN 220	American Food and Culture	3
FS HN 305	Food Quality Management and Control	2
FS HN 311	Food Chemistry	4
& 311L	and Food Chemistry Laboratory	
FS HN 403	Food Laws and Regulations	2
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 491D	Supervised Work Experience: Culinary Science	1-4
AN S 270	Foods of Animal Origin	3
& 270L	and Foods of Animal Origin Laboratory	
AN S 460	Science and Technology of Value Added Meat Products	3
HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	6
& 380L	and Food Production Management Experience	
HSP M 383	Wine and Spirits in Hospitality Management	2
or FS HN 509	Sensory Evaluation of Wines	
HSP M 487	Fine Dining Management	3

### Minor in Food and Society (16-17 credits required)

FS HN 101	Food and the Consumer	3
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 242	The US Food System	3
FS HN 342	World Food Issues: Past and Present	3
FS HN 442	Issues in Food and Society	2
Select 2-3 additional credits from:		2-3
AGRON 450	Issues in Sustainable Agriculture	
FS HN 220	American Food and Culture	
FS HN 364	Nutrition and Prevention of Chronic Disease	
FS HN 365	Obesity and Health	
FS HN 403	Food Laws and Regulations	
FS HN 460	Global Nutrition and Health	



FS HN 463	Community Nutrition and Health	
FS HN 496A	Food Science and Human Nutrition Travel Course: International travel	
SOC 220	Globalization and Sustainability	
SOC 345	Population and Society	
SOC 348	Global Poverty, Resources and Sustainable Development	
SOC 444	Sociology of Food and Agricultural Systems	

Interdepartmental Minor in Food Safety

FS HN 101	Food and the Consumer	3
or HSP M 233	Hospitality Sanitation and Safety	
FS HN 403	Food Laws and Regulations	2
FS HN 420	Food Microbiology	3
FS HN 489	Issues in Food Safety	1

Select 3 credits from the Food Microbiology area

FS HN/MICRO 407	Microbiological Safety of Foods of Animal Origins	
FS HN/MICRO 421	Food Microbiology Laboratory	
MICRO 310	Medical Microbiology	

Select 3 credits from the Food Processing area:

FS HN 207	Processing of Foods: Basic Principles and Applications	
FS HN 305	Food Quality Management and Control	
AN S 270 & 270L	Foods of Animal Origin and Foods of Animal Origin Laboratory	
AN S 360	Fresh Meat Science and Applied Muscle Biology	
FS HN 471	Food Processing	
FS HN 472	Food Processing Laboratory	

Minor in Food Science:

FS HN 101	Food and the Consumer	3
FS HN 207	Processing of Foods: Basic Principles and Applications	3

Select 9 additional credits:

Food chemistry:		
FS HN 311	Food Chemistry (lab optional: FS HN 311L)	3
FS HN 410	Food Analysis	3
FS HN 411	Food Ingredient Interactions and Formulations	2
Food microbiology:		
FS HN 407	Microbiological Safety of Foods of Animal Origins	3
FS HN 419	Foodborne Hazards	3

FS HN 420	Food Microbiology	3
FS HN 421	Food Microbiology Laboratory	3
Food processing/engineering:		
FS HN 351	Introduction to Food Engineering Concepts	3
FS HN 471	Food Processing	3
FS HN 472	Food Processing Laboratory	2
General food science:		
FS HN 305	Food Quality Management and Control	2
FS HN 403	Food Laws and Regulations	2
FS HN 406	Sensory Evaluation of Food	3

Select additional credits from the following list to meet a minimum of 15 credits for the minor:

FS HN 314	Professional Development for Culinary Food Science and Food Science Majors	1
FS HN 315	Professional Skills for Culinary Food Science and Food Science Majors	1

Minor in Nutrition: For students from outside the FSHN department

FS HN 167	Introductory Human Nutrition and Health	3
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3

Select at least 6 credits from:

FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 463	Community Nutrition and Health	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 492	Research Concepts in Human Nutrition	2
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4

Minor in Nutrition: For students majoring in culinary food science or food science

FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3

Select at least 9 credits from:

FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3

FS HN 463	Community Nutrition and Health	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 492	Research Concepts in Human Nutrition	2
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4

## Graduate Study

The Food Science and Human Nutrition (FSHN) Department offers coursework for the degrees master of science and doctor of philosophy. Degree options include:

- food science and technology (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/food-science-and-technology/>) (MS and PhD)
- meat science (<https://www.meatscience.ag.iastate.edu/>) (MS and PhD; co-major in animal science)
- nutritional sciences (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/interdepartmental-graduate-program-in-nutritional-sciences/>) (MS and PhD; interdepartmental graduate program)
- family and consumer sciences/dietetics (<https://online.hs.iastate.edu/graduate-degrees/dietetics/>) (MS only)
- diet and exercise (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/diet-and-exercise/>) (BS/MS)
- nutritional sciences (BS/MS)

Prerequisite to major work is a baccalaureate degree in food science, nutrition, other physical/biological sciences or engineering that is substantially equivalent to those at Iowa State University.

Students taking major work for the degree doctor of philosophy either in food science and technology or in nutritional sciences may choose minors from other fields including anthropology, biorenewable resources and technology, chemistry, biochemistry, economics, education, journalism, microbiology, psychology, physiology, statistics, toxicology, or other related fields.

The interdepartmental graduate program in nutritional sciences, administered through the Graduate College, under the auspices of the Chairs of FSHN and Animal Science, will provide the structure for coordinating and enhancing interdisciplinary nutrition research and graduate education. Graduate students will be able to select from three specializations: animal nutrition, human nutrition, or molecular/biochemical nutrition. The two main departments are FSHN and Animal Science, whereas other departments (such as Kinesiology; Biochemistry, Biophysics, and Molecular Biology; Agronomy; and Statistics) may also be involved.

The department offers work for concurrent B.S. and M.S. degree programs that allow students to obtain both the B.S. and M.S. degrees in 5 years. The programs are available to students majoring in nutritional science or pre-diet and exercise, and students progress toward M.S. degrees in nutritional sciences or diet and exercise, respectively. Students interested in these programs should contact the department for details. Application for admission to the Graduate College should be made during the junior year. Students begin research for the M.S. thesis or creative component during the summer after their junior year and are eligible for research assistantships.

Students graduating with advanced degrees in nutritional sciences and in food science and technology will demonstrate competency in their chosen discipline. Measurable outcomes will include the ability to: 1) design, conduct, and interpret research; 2) apply theoretical information to solve practical problems; 3) prepare and communicate discipline-specific information in written and oral forms to scientific and lay audiences; 4) facilitate learning in the classroom; 5) submit a paper for publication in a peer-reviewed journal; and 6) secure professional-level positions in academia, industry, government, or health care.

## Minors - Graduate

The department offers coursework for graduate minors in:

- food science/technology (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/food-science-and-technology/>)
- nutritional sciences (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/interdepartmental-graduate-program-in-nutritional-sciences/>)

Food Science and Technology Graduate Minor students must complete the following:

- 9 to 12 credits. Students without a background in food chemistry, food engineering/processing, and/or food microbiology are required to take FS HN 511 and two 600-level courses in two different competency areas.
- 9 credits of graduate level food science coursework as approved by the POS committee.
- Maximum of 3 credits at the 400 level.

Nutritional Sciences Graduate Minor students must complete the following:

- 9 to 12 credits are required. Students who have not taken FS HN 360 or its equivalent (advanced nutrition with a biochemistry prerequisite) will need to take FS HN 360, in which case the Nutrition Graduate minor will constitute 12 credits.

- 9 credits of graduate level nutrition courses as approved by the POS Committee.
- NUTRS 501

## Certificate - Undergraduate

Health Coach (<https://kin.hs.iastate.edu/current-students/academics/health-coach-certificate/>)

The undergraduate health coach certificate provides a rigorous academic and theoretical background in three components of health (nutrition, exercise and motivational coaching) required to prepare workers for the challenges of being a health coach.

## Certificates - Graduate

Food Safety and Defense (<http://www.fshn.hs.iastate.edu/graduate-program/food-safety-defense/>)

The department offers an online 12-13 credit Graduate Certificate in Food Safety and Defense, in conjunction with the University of Nebraska, Lincoln, Kansas State University and the University of Missouri through the Great Plains Interactive Distance Education Alliance. Students may be admitted if qualified for admission to the food science master's degree program .

### Courses primarily for undergraduates:

#### FS HN 101: Food and the Consumer

(3-0) Cr. 3. F.S.SS.

The food system from point of harvest to the consumption of the food by the consumer. Properties of food constituents. Protection of food against deterioration and microbial contamination. Introduction of foods into the marketplace. Processes for making various foods. Government regulations. Use of food additives. Current and controversial topics. High school biology and chemistry or 3 credits of college level biology and chemistry recommended.

#### FS HN 102: Nutrition for Sport Performance

(1-0) Cr. 1. F.S.

A scientific evaluation of dietary needs, dietary supplementation, and pop-culture claims relative to physical/sport performance. Discussion of safe and effective practices to enhance physical/sport performance.

#### FS HN 104: Introduction to Professional Skills in Culinary Science

(0-6) Cr. 1. S.

*Prereq: Major or minor in CUFS A or CUFS H*

Introduction to culinary science. Students will develop fundamental culinary skills by arranged on-campus work experience (100 hours). Sessions with instructor arranged.

#### FS HN 110: Professional and Educational Preparation

(1-0) Cr. 1. F.S.

Introduction to professional and educational development within the food science and human nutrition disciplines. Focus is on university and career acclimation as well as enhancement of communication skills. Offered on a satisfactory-fail basis only.

#### FS HN 111: Fundamentals of Food Preparation

(2-0) Cr. 2. S.

*Prereq: (FS HN 101 or FS HN 167); concurrent enrollment in FS HN 115*

Principles involved in preparation of food products of standard quality. Influence of composition and techniques on properties of food products.

#### FS HN 115: Food Preparation Laboratory

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 111 or FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety.

#### FS HN 120: The Biochemistry of Beer

(Cross-listed with BBMB). (2-0) Cr. 2. F.

An introduction to the major classes of biomolecules, basic biochemical concepts, enzymology, metabolism and genetic engineering as they apply to the production and flavor of beer. All aspects of the biochemistry of beer will be covered, including the malting of barley, starch conversion, yeast fermentation and the chemical changes that occur during the aging of beer. Intended for non-majors. Natural science majors are limited to elective credit only.

#### FS HN 120L: Biochemistry of Beer Laboratory

(Cross-listed with BBMB). Cr. 1.

*Prereq: Credit or concurrent enrollment in BBMB 120*

An introduction to biochemical methods related to the production of beer. Laboratory exercises related to water chemistry, mash enzymology, hop compound extraction and analysis, and yeast biology will be performed. Closely follows the material being taught in BBMB 120. Natural science majors are limited to elective credit only.

#### FS HN 167: Introductory Human Nutrition and Health

(3-0) Cr. 3. F.S.SS.

Understanding and implementing present day knowledge of nutrition. The role of nutrition in the health and well being of the individual and family. High school biology or 3 credits of biology recommended.

#### FS HN 203: Contemporary Issues in Food Science and Human Nutrition

(1-0) Cr. 1. F.S.

Introduction to presentation of published research and discussion of current issues in food science and human nutrition. Emphasis on sources of credible information, ethics, and communication.

**FS HN 207: Processing of Foods: Basic Principles and Applications**

(2-3) Cr. 3. S.

*Prereq: FS HN 101*

Lecture and lab-based instruction on principles of food processing and packaging. Food product-based discussion and activities will highlight raw food materials; unit operations; food quality and safety; processing plant sanitation; food forming and extrusion; fermentation; properties and selection of packaging materials.

**FS HN 214: Scientific Study of Food**

(3-0) Cr. 3. F.S.

*Prereq: (FS HN 167 or FS HN 265); (CHEM 231 or CHEM 331); concurrent enrollment in FS HN 115 or FS HN 215*

Composition and structure of foods. Principles of preparation of standard quality food products. Behavior and interactions of food constituents.

**FS HN 215: Advanced Food Preparation Laboratory**

(0-6) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety. Development of culinary skills and advanced food preparation.

**FS HN 220: American Food and Culture**

(3-0) Cr. 3. F.S.

American cuisine reflects the history of the U.S. It is the unique blend of diverse groups of people from around the world, including indigenous Native American Indians, Africans, Asians, Europeans, Pacific Islanders, and South Americans. Explore factors that impact the American Cuisine of today including diverse ethnic and cultural group influences, historical events related to food diversity in the U.S., and agriculture and industrial impacts on food production. Practical knowledge and basic food preparation techniques related to the U.S. food system and trends. Class sessions will include lectures, class discussions and Tasting Immersion activities.

**FS HN 241: Introduction to Manufacturing Processes for Plastics**

(Cross-listed with TSM). (1-2) Cr. 2. F.S.

*Prereq: MATH 145*

A study of selected materials and related processes used in plastics manufacturing. Lecture and laboratory activities focus on materials, properties, and processes.

**FS HN 242: The US Food System**

(3-0) Cr. 3. S.

*Prereq: FS HN 101 or FS HN 167*

Exploration of the components of our food system including production, processing, and access. A systems approach is used to evaluate the social, environmental, and nutrition/health implications of the US food system. Controversial topics related to how food is produced, processed, marketed and consumed will be discussed.

**FS HN 264: Fundamentals of Nutritional Biochemistry**

(3-0) Cr. 3. F.

*Prereq: FS HN 167; CHEM 163, CHEM 163L; 3 credits in BIOL*

Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

**FS HN 265: Nutrition for Active and Healthy Lifestyles**

(3-0) Cr. 3. S.SS.

*Prereq: FS HN 167; (FS HN 264 or 3 credits in BBMB)*

Fundamentals of nutrient metabolism and nutrient requirements. Role of macronutrient metabolism in physical performance and disease prevention. Effect of manipulation of macronutrient metabolism on physical performance and disease prevention. Applications of nutrient metabolism principles to dietary recommendations and planning.

**FS HN 276: Understanding Grape and Wine Science**

(Cross-listed with HORT). (2-2) Cr. 3. S.

A scientific introduction to viticulture (grape-growing) and enology (wine-making) and grape and wine chemistry. Topics include grape biology and cultivars, vineyard management, geography of wine, wine production, wine classification, grape and wine chemistry, wine sensory. No wine tasting.

**FS HN 301: Nutrigenomics: From Basic Science to Translational Impact**

(2-0) Cr. 1. F.

Introduction to the concepts of nutrigenomics and nutrigenetics and how it affects consumers of food, as well as the implications for human diseases. The potential impact of personalized nutrition and full genome sequencing on health maintenance, chronic disease prevention, and the ethical implications of this knowledge will be explored.

**FS HN 305: Food Quality Management and Control**

(2-0) Cr. 2. S.

*Prereq: 3 credits in STAT*

Fundamentals of statistical decision-making processes and quality control procedures used in food quality assurance programs.

**FS HN 311: Food Chemistry**

(3-0) Cr. 3. F.SS.

*Prereq: BBMB 300 or higher; (CHEM 231 or CHEM 331); ENGL 250*

The structure, properties, and chemistry of food constituents and animal and plant commodities.

**FS HN 311L: Food Chemistry Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in FSHN 311.*

The laboratory practices of structure, properties, and chemistry of food constituents.

**FS HN 314: Professional Development for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in Culinary Food Science or Food Science; Junior or senior classification.*

Introduction to the roles culinary scientists and food scientists hold within industry. Discussions focused on professional and educational development and emerging issues and trends in the food industry.

**FS HN 315: Professional Skills for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in FS HN*

Focus on the importance of professional skills and application of those skills to potential job situations. Professional skills include communication, team building, leadership vs. management styles, business ethics, and continual learning. Junior classification recommended.

**FS HN 340: Foundations of Dietetic Practice**

(2-0) Cr. 2. F.

*Prereq: Major in Dietetics (A or H) or Pre-Diet and Exercise; Junior classification*

Introduction to the profession of dietetics and responsibilities associated with dietetic professional practice. Emphasis on exploring career options in dietetics and preparation for supervised practice and graduate school. Leadership and professional career development for the dietitian is addressed through self reflection and creation of materials for post-baccalaureate programs. Professional issues related to dietetic practice include Code of Ethics, legal credentialing and standards of professional practice, leadership and future trends in the profession.

**FS HN 342: World Food Issues: Past and Present**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.SS.

*Prereq: Junior classification*

Issues associated with global agricultural and food systems including ethical, social, economic, environmental, and policy contexts. Investigation of various causes and consequences of overnutrition/ undernutrition, global health, poverty, hunger, access, and distribution. Meets International Perspectives Requirement.

**FS HN 351: Introduction to Food Engineering Concepts**

(3-0) Cr. 3. S.

*Prereq: (FS HN 207; [MATH 160 or MATH 165]; [PHYS 131 or PHYS 231]) or Permission of Instructor*

Methodology for solving problems in food processing and introduction to food engineering concepts including food properties, material and energy balances, sources of energy, thermodynamics, fluid flow, heat transfer, and mass transfer. Credit for only FS HN 351 or CH E 357 may be applied toward graduation for the Food Science major or Food Science minor

**FS HN 360: Advanced Nutrition and the Regulation of Metabolism in Health and Disease**

(3-0) Cr. 3. F.

*Prereq: ENGL 250; FS HN 265*

Physiological and biochemical basis for nutrient needs; assessment of nutrient deficiency and toxicity; examination of nutrient functions and the regulation of metabolism; nutrient-gene interactions; mechanistic role of nutrients in health and disease. 3 credits or concurrent enrollment in 300-level or above Biochemistry recommended. 3 credits in physiology recommended.

**FS HN 361: Nutrition and Health Assessment**

(1-3) Cr. 2. S.

*Prereq: FS HN 265*

The assessment of nutritional status in healthy individuals. Laboratory experiences in food composition and assessment of dietary intake, body composition, and biochemical indices of nutritional status.

**FS HN 362: Nutrition and Health Throughout the Lifecycle**

(3-0) Cr. 3. S.

*Prereq: FS HN 360; credit or concurrent enrollment in BIOL 256 or BIOL 335*

Molecular, biochemical and physiological basis to understand the nutritional aspects of human development and aging. Nutrient needs and various disease states at each stage of human life cycle.

**FS HN 364: Nutrition and Prevention of Chronic Disease**

(3-0) Cr. 3. F.

*Prereq: (BIOL 256; BIOL 256L) or enrolled in NRS major*

Overview of nutrients, their functions, metabolism, food sources and optimal choices for the promotion of health and wellness. Nutrition strategies for the prevention of chronic disease, including cancer, diabetes and obesity, as they apply to individuals or the wider population will be discussed.

**FS HN 365: Obesity and Health**

(3-0) Cr. 3. S.

Multifactorial aspects of obesity, maintenance of healthy weight, and the relationship of weight status and chronic disease prevention. Traditional and novel nutrition and exercise theories as well as current popular diet and exercise trends will be discussed.

**FS HN 366: Communicating Nutrition Messages**

(3-0) Cr. 3. S.

*Prereq: FS HN 264 or FS HN 265*

Theory and application of adult learning and behavior change as it relates to the role of nutrition in health promotion and disease prevention. Discussion of nutrition education and interventions relative to various models. Focus on communication strategies for providing nutrition messages to diverse community audiences using various forms of media and outreach.

**FS HN 367: Medical Terminology for Health Professionals**

(1-0) Cr. 1. F.S.SS.

An independent course focused on medical terminology, abbreviations, and simple clinical mathematical calculations.

**FS HN 392: Food and Nutrition Services Management**

Cr. 3. S.

*Prereq: HSP M 380; HSP M 380L*

Functions and responsibilities related to the management of foodservice systems and nutrition services, including planning, marketing, human resource management, and cost accounting. Only one of HSP M 392 or FS HN 392 may count toward graduation.

**FS HN 403: Food Laws and Regulations**

(2-0) Cr. 2. S.SS.

*Prereq: 3 credits in FS HN at 200-level or above*

History of food law in the US and the world. Relationship between policy, legislation and regulation. Introduction to primary US regulatory agencies and enforcement principles. Discussion of key laws related to food safety and nutrition. Overview of federal and independent research tools and sources of food law.

**FS HN 406: Sensory Evaluation of Food**

(Dual-listed with FS HN 506). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 507). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 408: Dairy Products Evaluation**

(0-3) Cr. 1. S.

Gain experience in identifying quality defects in dairy products including milk, cottage cheese, cheddar cheese, strawberry yogurt, butter, and vanilla ice cream. Intensive training for the National Collegiate Dairy Products Evaluation competition and for dairy product evaluation in the food industry.

**FS HN 410: Food Analysis**

(2-3) Cr. 3. F.

*Prereq: FS HN 311 or CHEM 211*

An introduction to the theory and application of chemical and instrumental methods for determining the constituents of food. Use of standard procedures for food analysis and food composition data bases.

**FS HN 411: Food Ingredient Interactions and Formulations**

(1-3) Cr. 2. F.S.

*Prereq: (FS HN 214 or FS HN 311); 3 credits in STAT*

Application of food science principles to ingredient substitutions in food products. Laboratory procedures for standard formulations and instrumental evaluation, with emphasis on problem-solving and critical thinking.



**FS HN 412: Food Product Development**

(Dual-listed with FS HN 512). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 419: Foodborne Hazards**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**FS HN 420: Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**FS HN 421: Food Microbiology Laboratory**

(Cross-listed with MICRO). (1-5) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**FS HN 430: U.S. Health Systems and Policy**

(Dual-listed with FS HN 530). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 435: Analysis of Food Markets**

(Cross-listed with ECON). Cr. 3. S.

*Prereq: ECON 235; ECON 301; STAT 226*

Food market analysis from an economics perspective; food markets and consumption; methods of economic analysis; food industry structure and organization; food and agriculture regulations; labeling; consumer concerns; agricultural commodity promotion. Final project required.

**FS HN 442: Issues in Food and Society**

(2-0) Cr. 2. F.

*Prereq: Sophomore classification*

In-depth discussion, synthesis, and analysis of domestic and global food issues from a systems approach. Mutually reinforcing interactions between culture, biology, and environmental influences on human dietary habits, nutrition and health will be emphasized. Historical and current foodways of cultural groups will be presented with specific attention to understanding cultural differences. Students will demonstrate how to locate, interpret, evaluate and use professional literature to inform about current food and society issues.

**FS HN 445: Strategies for Personal Food Waste Reduction**

(1-0) Cr. 1. S.

*Prereq: Junior classification*

In-depth analysis and discussion of economic, environmental, social, and ethical implications of food waste. Overview of personal food waste reduction strategies, food recycling/recovery, and responsible waste disposal methods. Discussion and application of advocacy tactics for the promotion of food waste reduction in local communities.

**FS HN 460: Global Nutrition and Health**

(Dual-listed with FS HN 560). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations. Meets International Perspectives Requirement.

**FS HN 461: Medical Nutrition and Disease I**

(Dual-listed with NUTRS 561). (4-0) Cr. 4. F.

*Prereq: (BIOL 256 or BIOL 335); FS HN 360; FS HN 361; FS HN 367*

Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and improve health.

**FS HN 463: Community Nutrition and Health**

(3-0) Cr. 3. F.

*Prereq: FS HN 361*

Dual-listed with NUTRS 563. Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups. Discussion of the multidimensional nature of those problems and of community programs addressing them. Grant writing as a means for funding community nutrition program development. Significant emphasis on written and oral communication at the lay and professional level.

**FS HN 464: Medical Nutrition and Disease II**

(4-0) Cr. 4. S.

*Prereq: FS HN 461*

(Dual-listed with NUTRS 564) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and promote health.

**FS HN 466: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 566). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 467: Molecular Basis of Nutrition in Disease Etiology and Health Promotion**

(3-0) Cr. 3. S.

*Prereq: 3 credits of BBMB 200 or above or Permission of Instructor*

Understanding the molecular basis for the role of nutrients, nutrient-derivatives, and bioactive compounds in the development, prevention, and treatment of common diseases including diabetes, cancer, vascular disease, obesity, neurological disease, aberrant mineral metabolism, and autoimmune disease. Translating this understanding into practical approaches for improving the health of individuals and populations. Credit for FS HN 360 suggested.

**FS HN 471: Food Processing**

(3-0) Cr. 3. F.

*Prereq: A B E 451 or CH E 357 or FS HN 351*

Principles and application of food processing using both thermal (ex., blanching, pasteurization, canning, drying, freezing, evaporation, aseptic processing, extrusion) and non-thermal (ex., high pressure, irradiation, pulsed electric field, fermentation) unit operations. Emphasis on microbial inactivation, process heat and mass balance, and numerical problem solving.

**FS HN 472: Food Processing Laboratory**

(1-3) Cr. 2. S.

*Prereq: FS HN 471*

Hands-on and demonstration laboratory activities related to food processing principles and applications using lab and pilot-scale equipment. Laboratory experiences include important food processing operations, e.g., blanching/pasteurization, canning, freezing, drying, corn wet milling, fermentation, baking etc. Emphasis on mass balance, interpreting data, writing reports, and presentations. Occasional field trips.

**FS HN 489: Issues in Food Safety**

(Cross-listed with AN S, HSP M, VDPAM). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**FS HN 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490A: Independent Study: Dietetics**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490B: Independent Study: Food Science**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490C: Independent Study: Nutrition**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490D: Independent Study: International Experience**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490E: Independent Study: Entrepreneurship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490H: Independent Study: Honors**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 491: Supervised Work Experience**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491A: Supervised Work Experience: Dietetics**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491B: Supervised Work Experience: Food Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491C: Supervised Work Experience: Nutrition**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491D: Supervised Work Experience: Culinary Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 492: Research Concepts in Human Nutrition**

(1-3) Cr. 2. F.

*Prereq: (FS HN 360; Senior classification) or Permission of Instructor*

Students will develop and implement research projects with faculty supervision, based on knowledge gained from nutrition, biology and chemistry courses and write a formal science paper to share the results of their research. Students will gain appreciation for independent research and experience creative and innovative aspects of nutrition research.

**FS HN 493: Food Preparation Workshop**

(1-3) Cr. 1-3.

Selected topics in food preparation including scientific principles, culture and culinary techniques. Variable format may include laboratory, recitation, and lecture. Offered on a satisfactory-fail basis only.

**FS HN 495: Practicum**

(1-3) Cr. 2. F.S.

*Prereq: FS HN 366; FS HN 463; Senior classification; major in Nutritional Science-Nutrition and wellness option*

Students will develop, implement and assess a community-based project that engages groups in learning and practicing concepts related to nutrition and wellness. Assessed service learning component. Offered on a satisfactory-fail basis only.

**FS HN 496: Food Science and Human Nutrition Travel Course**

(Dual-listed with FS HN 596). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

(One credit per week traveled and 1 credit for pre-departure class, if offered.) Limited enrollment. Tour and study of food industry, culinary science, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 496A: Food Science and Human Nutrition Travel Course:****International travel**

(Dual-listed with FS HN 596A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

**FS HN 496B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 596B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 498: Cooperative Education**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Permission of Department Chair*

Required for students completing professional work periods in a cooperative education program. Students must register prior to commencing each work period. Offered on a satisfactory-fail basis only.

**FS HN 499: Undergraduate Research**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Research under staff guidance. A maximum of 6 credits of FS HN 499 may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**FS HN 506: Sensory Evaluation of Food**

(Dual-listed with FS HN 406). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 407). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 508: Consumer Perceptions and Nutrition Communication**

(2-0) Cr. 2. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current consumer food and nutrition trends. Critical analysis of consumer perceptions relative to current research base. Use of various media to create effective nutrition messages for consumers. Activities designed to meet accreditation standards.

**FS HN 509: Sensory Evaluation of Wines**

Cr. 2. S.

*Prereq: Must be at least 21 years of age; senior or graduate status.*

Principles of sensory evaluation and their application to wine evaluation. Sensory testing methods such as discrimination tests, ranking, descriptive analysis and scoring of wines will be covered. Students will have the opportunity to evaluate and learn about major types and styles of wines of the world. Lab fee.

**FS HN 511: Integrated Food Science**

(3-0) Cr. 3. F.

*Prereq: 3 credits in each of organic chemistry, physics, mathematics, and microbiology.*

Critical review of the key principles of food science and applications in the chemistry, microbiology, and processing of food. Understanding of the impact of processing on the quality of foods with respect to composition, quality and safety.

**FS HN 512: Food Product Development**

(Dual-listed with FS HN 412). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 516: Advanced Nutrition I**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current literature relative to molecular, cellular, and physiologic aspects of macronutrient and micronutrient metabolism. Integration of current evidence-based information, including peer-reviewed literature, to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, MICRO, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**FS HN 518: Advanced Nutrition II**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Principles of research design/methods and interpreting results/statistics in the current peer-reviewed scientific literature. Critical evaluation of the evidence-base to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 521: Microbiology of Food**

(2-0) Cr. 2. S.SS.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Identification, enumeration, and characterization of bacteria, yeasts, and mold associated with foods and food processing. Effects of physical and chemical agents on micro-organisms will be studied. Microbiological problems in food spoilage, food preservation, food fermentation, and food-borne disease will be discussed.

**FS HN 522: Advanced Food Microbiology and Biotechnology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Food microbiology, a course in biochemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Basic principles in biotechnology and applied food microbiology, including current topics of interest in food biotechnology. Introduction to recombinant DNA techniques and how they are applied to genetically modify microorganisms, the use of nucleic acids as tools of rapid detection of microorganisms in foods, basic enzyme immobilization and down-stream processing techniques, and regulatory aspects of food biotechnology.

**FS HN 523: A Multidisciplinary Overview of Food Safety and Security**

(2-0) Cr. 2. F.SS.

*Prereq: A course in biology or chemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Multidisciplinary food safety and security perspectives provided by numerous subject matter experts. Topics include food safety policy, ag bioterrorism, border security, animal ID, food defense and site security, risk analysis, crisis communication, epidemiology, HACCP, and more.

**FS HN 524: Food Microbiology**

(3-0) Cr. 3. F.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Food Microbiology looks at the nature, physiology, and interactions of microorganisms in foods. The course is an introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Additionally, the course looks at food plant sanitation and criteria for establishing microbial standards for food products.

**FS HN 525: Principles of HACCP**

(2-0) Cr. 2. F.

*Prereq: Undergraduate biology and chemistry courses; enrollment in GP-IDEA Food Safety and Defense Certificate or permission of instructor.*

A comprehensive study of the Hazard Analysis and Critical Control Point System and its application in the food industry.

**FS HN 526: Ethnic Foods: Food Safety, Food Protection and Defense**

(2-0) Cr. 2. SS.

*Prereq: Graduate standing; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Understanding of the various factors that impact safety of ethnic and imported ethnic foods; knowledge about the handling, preparation, processing and storage of ethnic and imported foods and food products; science-based characterization of representative ethnic foods.

**FS HN 527: Microbiology of Fermented Foods**

(2-0) Cr. 2. SS.

*Prereq: Food microbiology; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Microbiology of fermented foods covers the physiology, biochemistry, and genetics of microorganisms important in food fermentations. The course looks at how microorganisms are used in fermentations and the effects of processing and manufacturing conditions on production of fermented foods.

**FS HN 528: Food Protection and Defense-Essential Concepts**

(2-0) Cr. 2. S.

*Prereq: Enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

This course will provide students with an understanding of the principles required in a food defense program for a food manufacturing, warehousing or distribution center. The topics covered include: defining threats and aggressors; the Bioterrorism Act; food defense teams; vulnerability assessments; security programs; recall and traceability basics; security inspections; crisis management; emergency preparedness; and workplace violence.

**FS HN 530: U.S. Health Systems and Policy**

(Dual-listed with FS HN 430). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 533: Diet and Integrative Therapies for Prevention and Treatment of Diseases**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Explore the role of specific nutrients, dietary bioactive compounds and integrative therapies on disease prevention and treatment. Activities designed to meet accreditation standards.

**FS HN 537: Leadership and Management in Dietetics**

(3-0) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program*

Application of leadership and management theories and approaches relevant to dietetics practice. Use of self-reflection and self-assessment to assist in recognition and development of leadership behaviors. Activities designed to meet accreditation standards.



**FS HN 538: Advanced Medical Nutrition Therapy**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Nutritional biochemistry and physiology related to selected pathophysiology of disease with emphasis on treatment of complex medical problems and current issues. The nutrition care process will be utilized. Evidenced-based practice will be integrated into each disease state covered to optimize nutritional status and promote health. Activities designed to meet accreditation standards.

**FS HN 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**FS HN 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**FS HN 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**FS HN 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**FS HN 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**FS HN 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**FS HN 544: Pediatric Clinical Nutrition**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examines the physiological, biochemical and nutritional aspects of disease processes relevant to infants and children up to 18 years of age. Discussion of medical nutrition therapy for a variety of medical conditions in this population including inborn errors of metabolism, food hypersensitivity, obesity, and diseases of the major organ systems.

**FS HN 554: Supervised Experience in Food Systems Management**

(0-22) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in food service and management. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 555: Supervised Experience in Community Nutrition**

(0-18) Cr. 3. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in community nutrition. Capstone project. Experiences and activities designed to meet accreditation standards.



**FS HN 556: Supervised Experience in Medical Nutrition Therapy**

(0-22) Cr. 5. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in medical nutrition therapy. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 560: Global Nutrition and Health**

(Dual-listed with FS HN 460). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations.

Meets International Perspectives Requirement.

**FS HN 562: Advanced Nutrition Assessment**

(4-0) Cr. 4. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Overview and practical applications of methods for assessing nutritional status, including: theoretical framework of nutritional health and disease, dietary intake, biochemical indices, nutrition focused physical exam and body composition across the lifecycle. Activities designed to meet accreditation standards.

**FS HN 566: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 466). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 575: Processed Foods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 214 or FS HN 311; a course in nutrition*

This course will examine effect of industrial and domestic food processing on the nutrient content of food and risk of developing chronic disease.

**FS HN 580: Orientation to Food Science and Nutrition Research**

(1-0) Cr. 1. F.

Orientation to and discussion of research interests in food science and nutrition. Discussion of policy and ethical issues in the conduct of research. Intended for entering students in FS HN. Offered on a satisfactory-fail basis only.

**FS HN 581: Seminar**

(1-0) Cr. 1. S.

Discussion and practice of oral presentation of scientific data in a professional setting. Discussion of issues related to data presentation. Intended for graduate students in their first or second semester in FS HN.

**FS HN 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with GERON, NEURO, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**FS HN 590: Special Topics**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590A: Special Topics: Nutrition**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590B: Special Topics: Food Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590C: Special Topics: Teaching**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 596A: Food Science and Human Nutrition Travel Course: International travel**

(Dual-listed with FS HN 496A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

**FS HN 596B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 496B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 599: Creative Component**

Cr. arr.

Nonthesis option only.

**Courses for graduate students:****FS HN 606: Advanced Food Analysis and Instrumentation**

(2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 410, or FS HN 511 or equivalent.*

Instrumental methods for measuring chemical and physical properties of foods, food quality and functionality. Techniques for methods development, sample preparation, optimization of operating conditions, and data analysis needed to obtain accurate, reproducible results by means of instrumentation.

**FS HN 611: Advanced Food Processing**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: FS HN 311, or FS HN 471/472 or equivalent, or FS HN 511.*

Recent advances in the science and technology of food processing and preservation; examples include both thermal and non-thermal processes, including cold plasma, nanotechnology, and extrusion. Advances in extraction and separation technologies, by-product utilization, and sustainability in food processing industry will also be discussed. Students to research on select topics and present.

**FS HN 612: Advanced Food Chemistry**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 411, or FS HN 511, or BBMB 404, or equivalent.*

Structure, chemical and physical properties of lipids, proteins and carbohydrates, and their food and industrial applications. Changes in functionalities during processing and storage.

**FS HN 626: Advanced Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**FS HN 627: Rapid Methods in Food Microbiology**

(Cross-listed with MICRO, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**FS HN 653: Food and Agricultural Traceability**

(3-0) Cr. 3. F.

*Prereq: Enrollment in The Ivy Executive MBA program within the Ivy College of Business at Iowa State University*

Current issues and concepts of food and agricultural product traceability in the U.S., from production to consumption. Food types, microbial agents of concern, adulterants, disease investigations, risk analysis, risk mitigation, prevention and regulatory policy and advocacy. Travel to Washington, D.C.

**FS HN 681: Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

Presentation of thesis or dissertation research. Must be taken once for each graduate program; once for the M.S. program and once for the Ph.D. program.

**FS HN 682: Seminar Reflection**

Cr. R. Repeatable. F.S.

Active listening and critical thinking activities related to research seminars in food science and human nutrition. Required each semester for all FSHN graduate students. Electronic documentation.

**FS HN 690: Special Problems**

Cr. arr. Repeatable. F.S.SS.

*Prereq: FS HN 502 or FS HN 503 or FS HN 504 or FS HN 553 or FS HN 554***FS HN 695: Grant Proposal Writing**

(Cross-listed with NUTRS). (1-0) Cr. 1. F.

*Prereq: 3 credits of graduate course work in food science and/or nutritional sciences*

Grant proposal preparation experiences including writing and critiquing of proposals and budget planning. Understanding the grant funding process from federal, foundation, and commodity agencies. Includes preparing a grant for possible submission and participation in the review of proposals. Discussion of the role of successful grant writing in career development.

**FS HN 699: Research in Food Science and Technology**

Cr. arr. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

## Forestry

Administered by the Department of Natural Resource Ecology and Management.

The forestry curriculum offers courses dealing with the management of forest ecosystems for multiple benefits including biodiversity, recreation, water, wilderness, wildlife, and wood and fiber. Conservation and preservation of natural resources are emphasized. The department offers work for the Bachelor of Science degree with a major in forestry and options in forest ecosystem management, interpretation of

natural resources, urban and community forestry, or natural resource conservation and restoration. Students select at least one of these options, all of which lead to a professional degree in forestry (Bachelor of Science). The forestry major has been accredited by the Society of American Foresters (SAF) since 1935. The Council for Higher Education Accreditation recognizes SAF as the specialized accrediting body for forestry education in the United States. The primary goal of the undergraduate curriculum in forestry is to educate foresters to be capable of scientifically managing the nation’s forest lands and related ecosystems - private and public.

Graduates understand and can apply scientific principles associated with forests, forest ecosystem management, and wood and non-wood products. Graduates are able to communicate effectively and work well in teams. They are capable of preparing and delivering effective oral and written communication of scientific and technical decisions to professional and lay audiences. They are proficient in technical skills such as measurements, computer usage, inventory, economic analysis, data and situation analysis, and ecosystem assessment. They recognize the importance of ethics in forestry and are sensitive to cultural diversity and broad environmental concerns.

Graduates of the forest ecosystem management option are skilled at understanding how forests function and how forests can be managed to produce desired goods (wood, fiber, recreation, wildlife habitat) and services (clean water, carbon sequestration, wilderness) in the long-run. They are skilled at interpretation of interactions and effects of abiotic and biotic factors in forests and quantification of bio-physical, social, and economic outputs from forest ecosystems. They are skilled at complex decision-making involving private and public forest resources where ethical, legal, social, economic, and ecological dimensions are explicitly considered.

Graduates of the interpretation of natural resources option are skilled at communicating with the public about the values associated with forest ecosystems and providing educational programs for all ages.

Graduates of the urban and community forestry option are able to combine biological, social, legal, and economic expertise to effectively manage trees or forests in an urban setting. They are skilled at decision-making related to site assessment, and long-term management of urban trees and forests to achieve multiple goals.

Graduates of the natural resource conservation and restoration option are skilled at assessing the natural functions of the environment and human impacts. They are skilled at interpretation of forest and other natural environments and making decisions relating to their conservation and preservation.

In consultation with their advisor, students can select elective courses related to the forest ecosystem management option to emphasize

forest ecology; wildlife, wilderness, and recreation management; water quality and erosion protection; quantitative-analytical techniques; business and marketing; and other areas related to natural resource management. Elective courses in the urban and community forestry option can be selected to emphasize plant health, policy and planning, ecology, hydrology, sociology, business administration, or horticulture/ design. Elective courses related to the natural resource conservation and restoration option can be selected to emphasize, ecology, wildlife, recreation, nature interpretation, landscape design, sociology and ethics of conservation and preservation. Elective courses in the interpretation of natural resources option can be selected to emphasize natural history, animal ecology, and environmental education.

Many private firms as well as national, regional, state, and local agencies seek forestry graduates to fill positions in management of natural resources for commodity and non-commodity multiple benefits. Graduates in forestry are prepared to be involved with evolving forestry systems, such as agroforestry and urban forestry. Wood processing industries, such as composite products, plywood, particle board, lumber, and pulp and paper offer professional opportunities in fiber procurement and marketing.

With advanced graduate study, the range of professional job opportunities for a person with a B.S. in forestry is expanded. Opportunities include research and education as well as more specialized managerial and administrative positions with private firms and public agencies.

During fall semester of the second year of study (sophomore year, typically), forestry students are required to enroll in the department’s integrated forestry modules consisting of:

FOR 201	Forest Biology	2
FOR 202	Sustainable Materials: Wood Utilization	2
FOR 203	Resource Measurements/Evaluation	2
FOR 204	Forest Ecosystem Decision-Making	2
FOR 205	Integrated Forestry Laboratory	3
FOR 206	Fall Forestry Camp	4

That semester, consisting entirely of forestry coursework, is designed to give students an early understanding of the many aspects of forestry and how they are interrelated. In addition to work in the classroom, students will spend time in laboratory and field work each week. A 3-week off-campus fall camp during the semester will reinforce concepts learned both in the classroom and during laboratory/field sessions. Transfer students should check with the department for counsel on timing their completion of the integrated forestry modules.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Identify, explain and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics.

For any given situation, graduates identify, critically evaluate, and state their own beliefs and values as they relate to professional and societal ethical standards, for any given situation. They elaborate on how those values and beliefs impact their actions, and they explain which specific canons or principles of a professional code of ethics are applicable to a particular situation.

2. Anticipate, analyze and evaluate natural resource issues and opportunities, explaining the ecological, economic, and social consequences of natural resource actions at various scales and over time.

In the case of existing natural resource issues, graduates explain the ecological, economic, and social consequences that reasonably could be expected to occur as the result of actions taken to address the issue. The explanation includes considerations of the geographic area influenced by the issue as well as the time frame over which the consequences can be expected to occur. In the case of evolving circumstances, graduates predict natural resource issues that may arise as a result of the circumstances and explain the ecological, economic and social consequences of those issues.

3. Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.

Graduates identify the comprehensive list of individuals or groups who may be impacted by particular natural resource problems and issues. They are well versed in techniques for seeking and incorporating input and perspectives from those people, and they incorporate those inputs and perspectives into the decision-making process.

4. Assess, analyze, synthesize, and evaluate information fairly and objectively.

Not all information is equally sound or applicable in a particular situation.

Graduates evaluate the validity and importance of information obtained from any source. Once evaluated, they use the information appropriately in the solution of natural resource problems.

5. Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem-solving approaches.

Effective solution of natural resource problems often involves input from diverse constituencies with diverse value scales. When working individually, graduates incorporate those values into the solution of

problems. Graduates work effectively with diverse individuals and groups to reach consensus on problem solutions.

6. Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.

The natural resource base with which we deal is capable of providing numerous goods and services to numerous publics. Graduates formulate multiple alternatives, as well as action plans, to achieve stakeholder objectives. They evaluate each of the feasible alternatives in terms of biological possibility, economic feasibility and social acceptability. They recommend best alternatives based on the stakeholders' objectives, and they justify their recommendations on the basis of sound science.

7. Communicate clearly and effectively with all audiences using appropriate oral, visual, electronic, and written techniques.

Graduates utilize the best form, or forms, of communication for effectively conveying information to, or seeking input from, a particular audience. They are proficient in all forms of communication, and adjust their style or technique of communication to suit different audiences.

8. Recognize and interpret resource problems and opportunities across spatial scales from local to global.

Graduates recognize where resource problems and opportunities can or could exist, and they evaluate and interpret these for others. They, evaluate and interpret for individual landowners at a very local scale as well as for problems that span multiple ownerships, regions and ecosystems.

9. Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.

Different cultures, population densities, and income classes value and use natural resources in very different ways. Because natural resources often are used simultaneously by different groups, it is important for graduates to be able to account for those differing uses and valuations when making management decisions about natural resources.

10. Exercise leadership skills as professionals and engaged citizens

Graduates organize, facilitate, and participate effectively in groups, teams, or organizations. They define problems or opportunities, implement action planning processes, work toward goals and justify actions taken.

11. Demonstrate creativity and innovation in identifying and pursuing opportunities that produce environmental, social, or economic value.

Graduates display creativity in a variety of situations, and identify opportunities to promote understanding of natural resource issues. They demonstrate persistence when working with individuals who have diverse

interests in order to build consensus and facilitate accomplishing stated objectives.

12. Exercise life-long learning skills developed before graduation.

Graduates articulate why life-long learning is important. Graduates find answers to their questions as they arise throughout life. They are capable of determining what they need to know to effectively deal with an issue or situation, and they know how to obtain the necessary knowledge. They have learned how to learn in the absence of teachers.

## Curriculum in Forestry

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

#### International Perspective: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communications Proficiency (with a C or better):

English composition	6
Speech fundamentals	3
<b>Total Credits</b>	<b>9</b>

#### Communication/Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
One course from:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 312	Communicating Science and Public Engagement	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>13</b>

#### Humanities and Social Sciences: 6 cr.

6 cr. from approved list.

#### Ethics: 3 cr.

3 cr. from approved list.

#### Mathematics, Physical and Life Sciences: 21-23 cr.

MATH 140	College Algebra	3
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
AGRON 182	Introduction to Soil Science	3
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
One course from:		3-4
STAT 101	Principles of Statistics	

STAT 104	Introduction to Statistics	
One course from:		3-4
MATH 151	Calculus for Business and Social Sciences	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
NREM 240	Quantitative Problem Solving in Natural Resources	
STAT 301	Intermediate Statistical Concepts and Methods	
<b>Total Credits</b>		<b>21-23</b>

#### Forestry: 31 cr.

NREM 104	Practical Work Experience	R
NREM 110	Orientation in Natural Resource Ecology and Management	1
NREM 120	Introduction to Renewable Resources	3
NREM 211	Careers in Natural Resources	1
FOR 201	Forest Biology	2
FOR 202	Sustainable Materials: Wood Utilization	2
FOR 203	Resource Measurements/Evaluation	2
FOR 204	Forest Ecosystem Decision-Making	2
FOR 205	Integrated Forestry Laboratory	3
FOR 206	Fall Forestry Camp	4
FOR 302	Silviculture	4
FOR 451	Forest Resource Economics and Quantitative Methods	4
FOR 454	Forestry Practicum	3
<b>Total Credits</b>		<b>31</b>

**Electives:** Students majoring in forestry are required to choose one of the following options at the end of their sophomore year: forest ecosystem management; sustainable material science and technology; urban and community forestry; natural resource conservation and restoration; or interpretation of natural resources.

#### Forest Ecosystem Management

FOR 280	Wood Properties and Identification	4
FOR 356	Dendrology	3
PL P 416	Forest Insects and Diseases	3
FOR 442	Dynamics of Forest Stands	3
FOR 452	Ecosystem Management	3
NREM 301	Natural Resource Ecology and Soils	4
NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	3
One course from:		3-4
A ECL 366	Natural History of Iowa Vertebrates	
A ECL 418	Stream Ecology	

ECON 380	Energy, Environmental and Resource Economics	
NREM 390	Fire Ecology and Management	
NREM 407	Watershed Management	
NREM 446	Integrating GPS and GIS for Natural Resource Management	
NREM 455	Stream restoration	
NREM 455L	Stream Restoration Lab	
NREM 471	Agroforestry Systems	
One course from:		3
NREM 385	Natural Resource Policy	
	or NREM 460	Controversies in Natural Resource Management
<b>Total Credits</b>		<b>29-30</b>

### Interpretation of Natural Resources

A ECL 365	Vertebrate Biology	4
A ECL 366	Natural History of Iowa Vertebrates	3
BIOL 366	Plant Systematics	4
ENT 370	Insect Biology	3
FOR 452	Ecosystem Management	3
NREM 303	Internship	1-3
NREM 330	Principles of Interpretation	3
One course from:		3
BIOL 474	Plant Ecology	
FOR 356	Dendrology	
One course from:		3-4
AGRON 206	Introduction to Weather and Climate	
ASTRO 120	The Sky and the Solar System	
GEOL 100	How the Earth Works	
GEOL 101	Environmental Geology: Earth in Crisis	
GEOL 108	Introduction to Oceanography	
One course from:		3
NREM 385	Natural Resource Policy	
NREM 460	Controversies in Natural Resource Management	
<b>Total Credits</b>		<b>30-33</b>

### Natural Resource Conservation and Restoration

A ECL 366	Natural History of Iowa Vertebrates	3
FOR 356	Dendrology	3
FOR 452	Ecosystem Management	3
NREM 301	Natural Resource Ecology and Soils	4
NREM 390	Fire Ecology and Management	3
NREM 407	Watershed Management	4
PL P 416	Forest Insects and Diseases	3
One course from:		3

NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	
NREM 446	Integrating GPS and GIS for Natural Resource Management	
One course from:		3
NREM 385	Natural Resource Policy	
NREM 460	Controversies in Natural Resource Management	
Three credit hours from approved list of electives		3
<b>Total Credits</b>		<b>32</b>

### Urban and Community Forestry

C R P 201	The North American Metropolis	3-4
or C R P 301	Urban Analytical Methods	
FOR 280	Wood Properties and Identification	4
FOR 356	Dendrology	3
FOR 452	Ecosystem Management	3
FOR 475	Urban Forestry	3
HORT 342	Landscape Plant Installation, Establishment, and Management	3
PL P 416	Forest Insects and Diseases	3
SOC 310	Community	3
or SOC 382	Environmental Sociology	
One course from:		3
NREM 385	Natural Resource Policy	
NREM 460	Controversies in Natural Resource Management	
<b>Total Credits</b>		<b>28-29</b>

Forestry, B.S. - Forest Ecosystem Management option

### Freshman

Fall	Credits Spring	Credits
NREM 110	1 CHEM 163	4
BIOL 211L	1 CHEM 163L	1
BIOL 211	3 STAT 101	4
ENGL 150	3 NREM 120	3
MATH 140**	3 Free Elective	3
LIB 160	1	
Approved Social Science course	3	
	<b>15</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
FOR 201	2 SP CM 212	3
FOR 202	2 ENGL 250	3



FOR 203	2 FOR 280	4
FOR 204	2 NREM 211	1
FOR 205	3 FOR 302	4
FOR 206	4 Required Elective	3
<b>15</b>		<b>18</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MATH 151, NREM 240, STAT 301, MATH 160, or MATH 165	3-4 FOR 451	4
FOR 356	3 Required Electives	6
NREM 301	4 NREM 345	3
NREM 345 or FOR 442	3 AGRON 182	3
Required Elective	3	
<b>16-17</b>		<b>16</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
FOR 442 or NREM 345	3 FOR 454	3
FOR 416	3 FOR 452	3
Communications Elective	3 Policy Elective	3
Free Elective	3 Required Elective	3
Free Elective	3 Free Elective	4
<b>15</b>		<b>16</b>

\* To complete degree program in 4 years students must maintain an average of 16 credits per semester.

\*\* Initial math course is determined on the basis of high school math and placement test scores. A non-credit math course (MATH 10) may be required at additional course.

\*\*\* In scheduling coursework, students should pay particular attention to courses with limited offerings (e.g., offered only on alternate years) and to course sequences (i.e., where a course serves as a prerequisite for another course).

Note: In addition to coursework listed above, students must complete departmental requirements for Practical Work Experience requirement (NREM 104). See <https://www.nrem.iastate.edu/workexperience> (<https://www.nrem.iastate.edu/workexperience/>)

## Forestry Minor

The department offers a minor in forestry which can be earned by completion of a minimum of 15 credits in forestry courses. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students wishing to emphasize management and environmental aspects of forestry must select at least 15 credits from the following courses:

FOR 302	Silviculture	4
FOR 356	Dendrology	3
FOR 416	Forest Insects and Diseases	3
FOR 442	Dynamics of Forest Stands	3
FOR 451	Forest Resource Economics and Quantitative Methods	4
FOR 452	Ecosystem Management	3
FOR 475	Urban Forestry	3
NREM 120	Introduction to Renewable Resources	3
NREM 301	Natural Resource Ecology and Soils	4
NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	3
NREM 390	Fire Ecology and Management	3
NREM 407	Watershed Management	4
NREM 446	Integrating GPS and GIS for Natural Resource Management	3

## Genetics

Genetics is the scientific study of heredity. Understanding the basis of heredity is fundamental to all aspects of the life sciences, from the most basic molecular study to applied studies of agricultural species. At Iowa State University the study of the life sciences is interdepartmental, involving faculty in the basic, agricultural, and veterinary sciences.

Faculty in 20 different departments are involved in genetics research. This large group of faculty presents a broad range of possibilities for students to learn from faculty who are at the forefront of research in many areas of genetics.

## UNDERGRADUATE STUDY

Undergraduate study in genetics is jointly administered by three departments: the Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology; the Department of Genetics, Development, and Cell Biology; and the Department of Ecology, Evolution, and Organismal Biology. Undergraduate degrees are offered through both the College of Agriculture and Life Sciences and the College of Liberal Arts and Science. Programs of study for genetics majors leading to a B.S. degree are available.

Training in genetics may lead to employment in teaching, research, or a variety of health-related professions. Although some students find employment directly after their baccalaureate training, many students continue their education in graduate or professional programs. Students with the B.S. degree may find employment in the biotechnology, health, or food industries. Recent graduates have also developed careers in conservation biology, technical writing, science journalism, technical sales, and business.

The required course work and associated electives provide students with the foundation in basic life sciences, mathematics, chemistry, and physics that is essential for professions involving modern biological/ biomedical sciences. As part of these courses students develop skills in problem solving, critical thinking, writing, and research-related activities in the biological sciences.

Specific entrance requirements for medical and health-related professions are established by the professional schools. Students interested in fulfilling pre-professional requirements for such professions as dentistry, human medicine, genetic counseling, optometry, pharmacy, physical therapy, physicians assistant, and veterinary medicine can major in genetics while fulfilling the pre-professional requirements.

### Student Learning Outcomes:

Upon graduation, students earning the BS degree in Genetics are expected to have achieved the following skills and capabilities:

- Comprehensive, detailed understanding of the chemical basis of heredity.
- Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
- Understanding the role of genetic mechanisms in evolution.
- The knowledge required to to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.
- The ability to recognize the experimental rationale of genetic studies as they are described in peer-reviewed research articles and grant proposals to federal and other funding agencies.
- The ability to evaluate conclusions that are based on genetic data.
- Insight into the mathematical, statistical, and computational basis of genetic analyses that use genome-scale data sets in systems biology settings.
- Understanding the role of genetic technologies in industries related to biotechnology, pharmaceuticals, energy, and other fields.
- Communication skills required in the discipline including oral presentations of research data, published research articles, grant proposals, and poster presentations at conferences.
- Teamwork and leadership skills including group analysis of data, working together in the research laboratory, joint compositions of written reports, substantive participation in research group meetings, etc.

## CURRICULUM IN GENETICS - REQUIREMENTS

### Total Degree Requirement: 120 cr.

A maximum of 65 cr. from a two-year institution can be applied that may include up to 16 technical cr.; up to 9 Pass-Not Pass cr. of free electives can be applied; a cumulative GPA of at least 2.0 is required for graduation. Program-approved lists can be found on the Genetics website.

### 1. Genetics and Life Sciences

A grade of C– or better is required in all Genetics and Life Science courses.

#### A. Courses required of all Genetics majors

GEN 110	Genetics Orientation	1
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 315	Biological Evolution	3
One of the following:		3-4
GEN 322	Introduction to Bioinformatics and Computational Biology	
GEN 349	The Genome Perspective in Biology	
BCBIO 406	Bioinformatics of OMICS	
GEN 409	Molecular Genetics	3
GEN 410	Analytical Genetics	3
One of the following:		3
GEN 462	Evolutionary Genetics	
EEOB 561	Evolutionary and Ecological Genomics	
EEOB 563	Molecular Phylogenetics	
GEN 491	Undergraduate Seminar, Professional Practice in Genetics Disciplines	1
MICRO 302	Biology of Microorganisms	3
<b>Total Credits</b>		<b>35-36</b>

#### B. Course required of majors in the College of Agriculture and Life Sciences only

A minimum of 3 cr. of coursework in the area of environmental science from program approved list	3
<b>Total Credits</b>	<b>3</b>

## 2. Advanced Sciences Electives: 6 cr. from program approved list

A grade of C- or better is required in each course. No more than 3 cr. of GEN 490, 490R, 490H, 492, 496, 499, or 499H may be used to meet this requirement.

## 3. Mathematical Sciences

Complete at least one calculus course from MATH, minimum of 4 credits. 4

MATH 160	Survey of Calculus	
MATH 165	Calculus I	

Complete at least one course from STAT, minimum of 3 credits. 3-4

STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	

Complete at least one additional course from MATH or STAT, minimum of 4 credits. 4

MATH 166	Calculus II	
STAT 301	Intermediate Statistical Concepts and Methods	

**Total Credits** 11-12

## 4. Supporting Sciences

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
CHEM 332	Organic Chemistry II	3
CHEM 332L	Laboratory in Organic Chemistry II	1
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
PHYS 132	General Physics II	4
PHYS 132L	General Physics II Laboratory	1

Choose one of the following options 6-7

Option 1

BBMB 404	Biochemistry I	
And one of the following:		
BBMB 405	Biochemistry II	
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	

Option 2

BBMB 420	Mammalian Biochemistry	
And one of the following:		
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	

**Total Credits** 33-34

## 5. International Perspectives: 3 cr. from university approved list

This course can satisfy **both** the university requirement for International Perspectives and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

## 6. U.S. Diversity: 3 cr. from university approved list

This course can satisfy **both** the university requirement for U.S. Diversity and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

## 7. Communications/Information Literacy

### A. Courses required of all Genetics majors

Grades of C or better are required in ENGL 250 and advanced writing. (The College of Agriculture and Life Sciences requires a C or better in ENGL 150, as well.)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
LIB 160	Introduction to College Level Research	1
One advanced English writing course from program approved list		3

**Total Credits** 10

### B. Course required of majors in the College of Agriculture and Life Sciences only.

A grade of C or better is required by the college.

SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	

**Total Credits** 3

## 8. General Education electives

Courses from college approved lists that also appear on university approved lists of U.S. Diversity or International Perspectives courses can be used to satisfy both requirements.

## A. College of Agriculture and Life Sciences

Humanities course from college approved list	3
Social Science course from college approved list	3
Ethics course from college approved list	3
<b>Total Credits</b>	<b>9</b>

## B. College of Liberal Arts and Sciences

Humanities courses from college approved list; one of these should be a Science/Humanities bridge course from program approved list	12
Social Science courses from college approved list	9
Students must have completed 3 years of a single world language in high school or take 4-8 credits of World Languages at the university level.	
<b>Total Credits</b>	<b>21</b>

Genetics, B.S.

### Freshman

Fall	Credits	Spring	Credits
GEN 110		1 ENGL 250 or Social Sciences Choice	3
BIOL 211		3 BIOL 212	3
BIOL 211L		1 BIOL 212L	1
CHEM 177		4 CHEM 178	3
CHEM 177L		1 CHEM 178L	1
ENGL 150 or 250		3 MATH/ STAT choice or Humanities Choice	3-4
LIB 160		1 Consider Research (HON 290 or GEN 499)	0-2
MATH/ STAT choice or Humanities Choice	3-4		
<b>17-18</b>		<b>14-17</b>	

### Sophomore

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 313		3 BIOL 314		3 Consider Internship, Study Abroad	
BIOL 313L		1 CHEM 332		3	
CHEM 331		3 CHEM 332L		1	
CHEM 331L		1 MICRO 302		3	
SP CM 212		3 MATH/ STAT Choice or Social Sciences *		3-4	
MATH/ STAT Choice or Social Sciences *		3-4 Ethics Choice		3	
<b>14-15</b>		<b>16-17</b>		<b>0</b>	

### Junior

Fall	Credits	Spring	Credits	Summer	Credits
GEN 409		3 BIOL 315		3 Consider Research with Faculty	
U.S. Diversity/ Social Sciences Choice		3 or Bioinformatics Choice			
BIOL 315		3 BBMB 405		3	
BBMB 404		3 GEN 410		3	
PHYS 131 or 231		4 GEN 491 (or Fall of Senior Year)		1	
PHYS 131L or 231L		1 PHYS 132		4	
		PHYS 132L		1	
<b>17</b>		<b>15</b>		<b>0</b>	

**Senior**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
GEN 462		3 Advanced Science Electives	3-6
STAT 301 (or Advanced Science Elective)		4 International Perspectives/ Humanities	3
ENGL 312 (or other ENGL 302-316)		3 True Electives	3-6
Environmental Awareness Choice	3-4		
<b>13-14</b>		<b>9-15</b>	

## Undergraduate Minor

The minor in Genetics may be earned by completing the following courses. At least 9 cr. must be used **only** to fulfill the requirements of the minor and not be applied to any other major, college, or university requirement.

GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
GEN 410	Analytical Genetics	3
GEN 409	Molecular Genetics	3
Two or more additional credits in Genetics at the 300 level or above.		2
<b>Total Credits</b>		<b>15</b>

## Global Resource Systems

The Global Resource Systems undergraduate major employs a truly interdisciplinary and systemic approach to understanding complex global resource issues. Students develop a core set of technical competencies in a resource area selected from the majors, minors and certificates offered by the College of Agriculture and Life Sciences. Students choose a world region in which to specialize, develop competency in a relevant world language, and participate in a significant cross-cultural internship experience. They carry out a senior project related to their resource specialization within the context of the world region. The undergraduate experience culminates with a senior capstone course, where students work with real-world clients to address global resource challenges.

Multidisciplinary themes are developed in the context of the physical, biological and socio-economic factors affecting global resource systems. In this context, resource systems include natural, food and agricultural, environmental, cultural and human, political and institutional, financial and built, public health and social resources. Graduates of this program have transnational leadership skills and are successful integrators of various specializations on a team. They are skilled in applying a systemic perspective and developing solutions to complex global resource systems problems using innovativeness and creativity. Future professionals communicate effectively and demonstrate environmental awareness, exhibit an ethical perspective, and display clear analysis of how cultural diversity impacts work both here and abroad. They also recognize opportunities for learning after graduation.

A degree in Global Resource Systems opens the door to employment opportunities in the many businesses and organizations that require globally competent employees.

### Student Learning Outcomes

Upon graduation, students should be able to:

Understand sustainable global resource systems by summarizing factors of biological, physical, and social resources in global systems and predicting the consequences of the utilization and distribution of global resources and their systems; develop an attitude of curiosity to continue lifelong learning.

Apply global competency skills by recognizing diverse cultures, reflecting on the value of cultures on global resource systems, and employing skills needed to work in different cultures.

Design ethical and innovative solutions to global challenges by using information literacy skills to define global challenges and creating sustainable solutions to global challenges.

Use communication and leadership skills by communicating effectively with diverse audiences using written, oral, visual, and electronic skills and participating effectively as leaders in teams and organizations.

## Curriculum in Global Resource Systems

Administered by a supervisory committee in the College of Agriculture and Life Sciences. Students choose a region of the world to develop an expertise; they choose a language to learn and develop proficiency through the intermediate level; they choose and possess an area of technical expertise by completing an additional major, minor or certificate program offered through the College of Agriculture and Life Sciences; they complete a required internship in an international setting; and they select and complete a senior research project with faculty mentoring.

**Total Degree Requirement: 129 cr.**

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

**International Perspective: 3 cr.**

3 cr. from approved list

**U.S. Diversity: 3 cr.**

3 cr. from approved list

**Communications Proficiency:**

English composition (6 credits with a grade of C or higher; see courses below.)

Speech fundamentals (3 credits with a grade of C or higher; see courses below.)

**Communication/Library: 13 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
ENGL 302	Business Communication	3
or ENGL 309	Proposal and Report Writing	
or ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1

**Total Credits** 13

**Humanities and Social Sciences: 6 cr.**

ECON 101	Principles of Microeconomics	3
or ECON 102	Principles of Macroeconomics	
Plus three credit hours from approved humanities list		3

**Total Credits** 6

**Ethics: 3 cr.**

3 cr. from approved list

**Life Sciences: 7 cr.**

BIOL 211	Principles of Biology I	4
& 211L	and Principles of Biology Laboratory I	
or BIOL 212	Principles of Biology II	
& 212L	and Principles of Biology Laboratory II	
Plus 3 cr. from approved life sciences list at 300-level or higher		3

**Mathematical Sciences: 6 cr.**

MATH 140	College Algebra (or higher; except Math 195, 196)	3
STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	

**Total Credits** 6-7

**Global Competency: 15-31 cr.**

16 cr. of 100 and 200 level of a single WLC language; 15 cr. in global competency courses from an approved list with up to 3 cr. may be earned from a travel course.

**Physical Sciences: 8 cr.**

One of the following: 5

CHEM 163	College Chemistry
& 163L	and Laboratory in College Chemistry
or CHEM 171	General Chemistry I
& 177L	and Laboratory in General Chemistry I

One course from the following: 3

AGRON 182	Introduction to Soil Science
AGRON 206	Introduction to Weather and Climate
AGRON 282	Soil Conservation and Land Use
GEOL 101	Environmental Geology: Earth in Crisis
GEOL 160	Water Resources of the World

**Total Credits** 8

**Global Resource Systems: 23 cr.**

GLOBE 110 Orientation 1

GLOBE 201 Introduction to Global Resource Systems 3

3 credits of GLOBE 211 3

GLOBE 211 Issues in Global Resource Systems (Each offering is 1 cr., must be repeated for 3 cr.)

GLOBE 303 Agricultural, Food and Natural Global Resource Systems 3

GLOBE 304 Socio-Economic Global Resource Systems 3

GLOBE 320 Global Resource Systems Internship Preparation 1

One of the following: 3-6

GLOBE 321 Internship - Global

GLOBE 322 Internship - United States

GLOBE 401 Senior Project 3

GLOBE 402 Responses to Global Resource System Challenges 3

**Total Credits** 23-26

**Technical Concentration: 15-18 cr.**

Satisfied by any of the majors, minors or certificates offered through the College of Agriculture and Life Sciences.

**Electives:**

Sufficient coursework to ensure a total of not less than 129 credits

Global Resource Systems, B.S.



**Freshman**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
GLOBE 110	1 GLOBE 201	3
MATH 140	3 ECON 101	3
ENGL 150	3 ENGL 250	3
LIB 160	1 CHEM 163	4
BIOL 211	3 CHEM 163L	1
BIOL 211L	1 STAT 104	3
Humanities	3	
	<b>15</b>	<b>17</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
GLOBE 303	3 GLOBE 304	3
Language 101	4 Language 102	4
GLOBE 211	1 GLOBE 211	1
Global Politics or Global Culture	3 AGEDS 311 or SP CM 212	3
Technical Area	3 AGRON 182, 206, 282, GEOL 101, or GEOL 160	3
Elective	3 Technical Area	3
	<b>17</b>	<b>17</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
GLOBE 211	1 GLOBE 320	1
Language 201	4 Language 202	4
ENGL 309	3 Global History or Global Culture	3
Global Culture	3 AGRON 342 (or Other CALS Approved Ethics)	3
US Diversity	3 Technical Area	3
General Elective	3 General Elective	3
	<b>17</b>	<b>17</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
GLOBE 321	3 GLOBE 402	3
GLOBE 401	3 Global Culture	3
International Perspectives	3 300 Level or Higher Life Science	3
Global Competency	3 Technical Area	3
Technical Area	3 General Elective	2
	<b>15</b>	<b>14</b>

## Horticulture

To meet the educational needs of a student population with interests ranging from plant physiology to landscape design/installation to fruit and vegetable production to golf course/athletic field construction and management, considerable flexibility is built into the horticulture curriculum. The diversity of interests and need for flexibility are reflected in the impressive array of horticulture courses offered.

The Department of Horticulture offers six options within the horticulture major:

1. Greenhouse Plant Production
2. Horticultural Food Crop Production and Management
3. Landscape Design, Installation, and Management
4. Public Horticulture
5. Horticulture Research
6. Turfgrass Management

Graduates possess the technical knowledge and skills to become professional horticulturists. They understand principles of life science, plant growth and development, and are familiar with cultural and management practices for a wide assortment of horticultural crops. They are able to work and communicate effectively with fellow horticultural professionals and other citizens who share an interest in horticulture. Graduates also understand the ethical and environmental dimensions of problems and issues facing horticultural professionals.

A degree in horticulture opens the door to employment opportunities with production nurseries, seed companies, interior landscaping firms, greenhouses, garden centers, conservatories, landscape design/installation firms, public gardens and arboreta, orchards and vineyards, food processing companies, vegetable farms, fertilizer cooperatives, agricultural chemical companies, golf courses, sports fields, sod production companies, and lawn care businesses. Several allied plant-science industries also provide employment opportunities in the areas of sales, management, and communication. Opportunities exist for careers in research, teaching, extension, and business after obtaining advanced training in graduate school.

### Student Learning Outcomes

Upon graduation, students should be able to:

1. Acquire, integrate, and apply knowledge of plant science to manage systems.
2. Demonstrate interdisciplinary knowledge and competency in managing horticulture systems.
3. Synthesize knowledge and use insight and creativity to better understand and improve plant systems.

4. Appreciate and communicate the diverse impacts of horticulture on people.
5. Demonstrate professionalism and proficiency in skills that relate to horticulture.

## Degree Requirements

Students majoring in horticulture will select an option in which to specialize before reaching junior standing and will fulfill the requirements described below under Options.

### Total Degree Requirement: 129 credits

Only 65 credits from a two-year institution may apply which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

#### Biological Sciences: 18 cr.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
And complete fourteen credit hours from the following:		14
AGRON 217	Weed Identification	
AGRON 282	Soil Conservation and Land Use	
AGRON 316	Crop Structure-Function Relationships	
AGRON 317	Principles of Weed Science	
AGRON 354 & 354L	Soils and Plant Growth and Soils and Plant Growth Laboratory	
BIOL 212 & 212L	Principles of Biology II and Principles of Biology Laboratory II	
BIOL 312	Ecology	
BIOL 313 & 313L	Principles of Genetics and Genetics Laboratory	
	or GEN 320 Genetics, Agriculture and Biotechnology	
BIOL 314	Principles of Molecular Cell Biology	
BIOL 355	Plants and People	
BIOL 366	Plant Systematics	
BIOL 430	Principles of Plant Physiology	
BIOL 454	Plant Anatomy	
BIOL 474	Plant Ecology	
ENT 201	Introduction to Insects	
ENT 211	Insects and Society	
ENT 370	Insect Biology	
ENT 375	Plant Protection Using Natural Enemies	
ENT 376	Fundamentals of Entomology and Pest Management	
FOR 416	Forest Insects and Diseases	

PL P 408	Principles of Plant Pathology	
<b>Total Credits</b>		<b>18</b>

#### Communications Proficiency (with a grade of C or better)

6 credits of English composition (see approved courses below)

3 credits of speech fundamentals (see approved courses below)

#### Communication/Library: 13 cr .

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
ENGL 302	Business Communication	3
or ENGL 309	Proposal and Report Writing	
or ENGL 314	Technical Communication	
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
COMST 214	Professional Communication	
<b>Total Credits</b>		<b>13</b>

#### Ethics: 3 cr.

3 cr. from approved list 3

#### Humanities and Social Sciences: 6 cr.

Approved Humanities course	3
Approved Social Science course	3
<b>Total Credits</b>	<b>6</b>

#### International Perspective: 3 cr.

3 cr. from approved list 3

**Total Credits** 3

#### U.S. Diversity: 3 cr.

3 cr. from approved list 3

**Total Credits** 3

#### Life Sciences: 6 cr.

BIOL 211	Principles of Biology I	3
Approved Life Sciences course		3
<b>Total Credits</b>		<b>6</b>

#### Mathematical Sciences: 6 cr.

Select one course from the following: 3

MATH 140	College Algebra	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 165	Calculus I	

AND select one of the following: 3

STAT 101	Principles of Statistics
STAT 104	Introduction to Statistics
STAT 226	Introduction to Business Statistics I
STAT 301	Intermediate Statistical Concepts and Methods

**Total Credits** 6**Physical Sciences: 11 cr.**

Complete one of the following: 5

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I

AND complete one course from the following: 3-4

AGRON 259	Organic Compounds in Plants and Soils
CHEM 178 & 178L	General Chemistry II and Laboratory in College Chemistry II
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I
PHYS 101	Physics for the Nonscientist
PHYS 115	Physics for the Life Sciences
PHYS 131 & 131L	General Physics I and General Physics I Laboratory

AND complete one course from the following: 3-5

BBMB 221	Structure and Reactions in Biochemical Processes
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I

**Total Credits** 11-14**Horticultural Sciences: Minimum of 30 cr.**

HORT 110	Professional and Educational Development in Horticulture.	1
HORT 221	Principles of Horticulture Science	3
HORT 321	Horticulture Physiology	3
Select 23 cr. hours from courses within selected option.		23

**Total Credits** Minimum  
of  
30

**Soil Sciences: 3 cr.**

AGRON 182	Introduction to Soil Science	3
<b>Total Credits</b>		<b>3</b>

**Electives**

No more than 4 cr. of Hort 490 may count toward graduation.

**Options****Greenhouse Plant Production**

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 322	Plant Propagation	3
HORT 330	Herbaceous Ornamental Plants	3
HORT 331	Hydroponic Crop Production	2
HORT 332	Greenhouse and Nursery Operations and Management	4
HORT 434	Floriculture Crop Production	3
HORT 435	Landscape Plant Production	3

Other recommended courses are:

HORT 391	Horticultural Management Experience
HORT 424	Sustainable and Environmental Horticulture Systems
HORT 476	Horticultural Postharvest Technology
HORT 233	House Plants and Interiorscaping

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 215	Legal Environment of Business
ACCT 285	Managerial Accounting
ACCT 416	Business Law
AGRON 206	Introduction to Weather and Climate
COM S 103	Computer Literacy and Applications
ECON 101	Principles of Microeconomics
ECON 102	Principles of Macroeconomics
ECON 230	Farm Business Management
ECON 234	Small Business Management
ECON 334	Entrepreneurship in Agriculture
ENTSP 310	Entrepreneurship and Innovation
ENTSP 313	Feasibility Analysis for New Ventures
MGMT 370	Managing Organizations
MGMT 371	Organizational Behavior
MKT 340	Principles of Marketing
MKT 442	Sales Management
MKT 447	Consumer Behavior
TSM 270	Principles of Injury Prevention and Safety

## Horticultural Food Crop Production and Management

The following courses are required to meet the Horticulture requirement:

HORT 276	Understanding Grape and Wine Science	3
HORT 376	Fundamentals of Field Production of Horticultural Food Crops	3
HORT 461	Fruit Crop Production and Management	3
HORT 471	Vegetable Production and Management	2
HORT 471L	Vegetable Production and Management Lab	1
HORT 476	Horticultural Postharvest Technology	3

### Other recommended courses:

HORT 322	Plant Propagation	
HORT 331	Hydroponic Crop Production	
HORT 332	Greenhouse and Nursery Operations and Management	
HORT 338	Seed Science and Technology	
HORT 391	Horticultural Management Experience	
HORT 484	Organic Agricultural Theory and Practice	

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 215	Legal Environment of Business	
ACCT 285	Managerial Accounting	
ACCT 416	Business Law	
COM S 103	Computer Literacy and Applications	
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
ECON 230	Farm Business Management	
ECON 234	Small Business Management	
ECON 334	Entrepreneurship in Agriculture	
ENV S 293	Environmental Planning	
ENV S 324	Energy and the Environment	
ENV S 382	Environmental Sociology	
ENV S 491	Environmental Law and Planning	
FS HN 403	Food Laws and Regulations	
FS HN 471	Food Processing	
FS HN 472	Food Processing Laboratory	
ENTSP 310	Entrepreneurship and Innovation	
ENTSP 313	Feasibility Analysis for New Ventures	
MGMT 370	Managing Organizations	
MGMT 371	Organizational Behavior	
MKT 340	Principles of Marketing	
MKT 442	Sales Management	

MKT 447	Consumer Behavior	
TSM 270	Principles of Injury Prevention and Safety	
TSM 324	Soil and Water Conservation Management	

## Horticulture Research

The following courses are required for this option:

AGEDS 312	Science With Practice	3
HORT 322	Plant Propagation	3

### Biological Sciences:

BIOL 430	Principles of Plant Physiology	3
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### Other recommended courses:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	
HORT 330	Herbaceous Ornamental Plants	
HORT 331	Hydroponic Crop Production	
HORT 332	Greenhouse and Nursery Operations and Management	
HORT 342	Landscape Plant Installation, Establishment, and Management	
HORT 376	Fundamentals of Field Production of Horticultural Food Crops	
HORT 391	Horticultural Management Experience	

### Mathematical Sciences Requirement: 8

MATH 165	Calculus I	
MATH 166	Calculus II	

### Physical Sciences Requirement:

BBMB 301	Survey of Biochemistry or BBMB 404 Biochemistry I or BBMB 316 Principles of Biochemistry	
CHEM 177	General Chemistry I	
CHEM 177L	Laboratory in General Chemistry I	
CHEM 178	General Chemistry II	
CHEM 178L	Laboratory in College Chemistry II	
CHEM 331	Organic Chemistry I	
CHEM 331L	Laboratory in Organic Chemistry I	
CHEM 332	Organic Chemistry II	
CHEM 332L	Laboratory in Organic Chemistry II	
PHYS 131 & 131L	General Physics I and General Physics I Laboratory	
PHYS 132 & 132L	General Physics II and General Physics II Laboratory	

And select 5 cr. hours from the following:

BBMB 405	Biochemistry II	
BBMB 404	Biochemistry I	

or BBMB 316 Principles of Biochemistry

BBMB 411	Techniques in Biochemical Research
BIOL 313	Principles of Genetics
BIOL 313L	Genetics Laboratory
BIOL 314	Principles of Molecular Cell Biology
BIOL 315	Biological Evolution
CHEM 211	Quantitative and Environmental Analysis
CHEM 211L	Quantitative and Environmental Analysis Laboratory
CHEM 316	Instrumental Methods of Chemical Analysis
CHEM 316L	Instrumental Analysis Laboratory
CHEM 321L	Laboratory in Physical Chemistry
CHEM 322L	Laboratory in Physical Chemistry
CHEM 324	Introductory Quantum Mechanics
COM S 107	Windows Application Programming or COM S 20 Fundamentals of Computer Programming
GEN 409	Molecular Genetics
GEN 410	Analytical Genetics

## Landscape Design, Installation and Management

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 281	Landscape Graphics	2
HORT 330	Herbaceous Ornamental Plants	3
HORT 341	Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs	2
HORT 342	Landscape Plant Installation, Establishment, and Management	3
HORT 351	Turfgrass Establishment and Management	3
HORT 380	Principles of Garden Composition	2
HORT 381	Beginning Garden Composition Studio	2
HORT 444	Landscape Construction Management	3
HORT 481	Advanced Garden Composition	2

Other recommended courses are:

HORT 322	Plant Propagation
HORT 332	Greenhouse and Nursery Operations and Management
HORT 391	Horticultural Management Experience

Required for option:

ACCT 284	Financial Accounting	3
And select 9 cr. hours from the following:		9
ACCT 215	Legal Environment of Business	

ACCT 285	Managerial Accounting
ACCT 416	Business Law
COM S 103	Computer Literacy and Applications
ECON 234	Small Business Management
ECON 334	Entrepreneurship in Agriculture
ENTSP 310	Entrepreneurship and Innovation
ENTSP 313	Feasibility Analysis for New Ventures
MGMT 370	Managing Organizations
MGMT 371	Organizational Behavior
MKT 340	Principles of Marketing
MKT 442	Sales Management
MKT 447	Consumer Behavior
TSM 324	Soil and Water Conservation Management

## Public Horticulture

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 322	Plant Propagation	3
HORT 330	Herbaceous Ornamental Plants	3

Other recommended courses:

HORT 233	House Plants and Interiorscaping
HORT 281	Landscape Graphics
HORT 332	Greenhouse and Nursery Operations and Management
HORT 341	Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs
HORT 342	Landscape Plant Installation, Establishment, and Management
HORT 351	Turfgrass Establishment and Management
HORT 351L	Turfgrass Establishment and Management Laboratory
HORT 376	Fundamentals of Field Production of Horticultural Food Crops
HORT 380	Principles of Garden Composition
HORT 381	Beginning Garden Composition Studio
HORT 391	Horticultural Management Experience

Required for option

ACCT 284	Financial Accounting	3
And select 9 credit hours from the following:		9

ACCT 215	Legal Environment of Business
ACCT 285	Managerial Accounting
ACCT 416	Business Law
AGEDS 310	Foundations of Agricultural Education Programs

AGEDS 401	Planning Agriculture and Life Sciences Education Programs
COMST 211	Interpersonal Communication
COMST 214	Professional Communication
COMST 317	Small Group Communication
ECON 101	Principles of Microeconomics
ECON 234	Small Business Management
ECON 334	Entrepreneurship in Agriculture
ENGL 220	Descriptive English Grammar
ENGL 303	Free-Lance Writing for Popular Magazines
ENGL 305	Creative Writing: Nonfiction
ENGL 309	Proposal and Report Writing
ENGL 313	Rhetorical Website Design
ENGL 415	Business and Technical Editing
ENGL 416	Visual Aspects of Business and Technical Communication
ENSCI 446	Integrating GPS and GIS for Natural Resource Management
FIN 301	Principles of Finance
JL MC 201	Reporting and Writing for the Mass Media
JL MC 310	Fundamentals of Photojournalism
MGMT 370	Managing Organizations
MGMT 371	Organizational Behavior
MGMT 471	Introduction to Human Resource Management
P R 220	Principles of Public Relations
SP CM 312	Business and Professional Speaking

## Turfgrass Management

The following courses are required to meet the Horticulture requirement:

HORT 240	Trees, Shrubs, and Woody Vines for Landscaping	3
HORT 351	Turfgrass Establishment and Management	3
HORT 351L	Turfgrass Establishment and Management Laboratory	1
HORT 451	Professional Turfgrass Management	2
HORT 453	Sports Turf Management	3
HORT 454	Turf & Landscape Irrigation	3
HORT 551	Growth and Development of Perennial Grasses	2

Other recommended courses:

HORT 330	Herbaceous Ornamental Plants
HORT 322	Plant Propagation
HORT 391	Horticultural Management Experience
HORT 424	Sustainable and Environmental Horticulture Systems

Required for option:

ACCT 284	Financial Accounting	3
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And select 9 cr. hours from the following: 9

ACCT 285	Managerial Accounting
ACCT 416	Business Law
AGRON 206	Introduction to Weather and Climate
AGRON 360	Environmental Soil Science
AGRON 459	Environmental Soil and Water Chemistry
COM S 103	Computer Literacy and Applications
ECON 234	Small Business Management
ECON 334	Entrepreneurship in Agriculture
ENV S 201	Introduction to Environmental Issues
ENV S 324	Energy and the Environment
HSP M 101	Introduction to the Hospitality Industry
HSP M 289	Contemporary Club Management
MGMT 370	Managing Organizations
MGMT 371	Organizational Behavior
TSM 270	Principles of Injury Prevention and Safety
TSM 324	Soil and Water Conservation Management

## Horticulture, B.S. Greenhouse Plant Production Option

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 ENGL 250	3
CHEM 163	4 BIOL 211	3
CHEM 163L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ENT 201	1 HORT 332	4
ENT 211	2 AGRON 282	3
HORT 240	3 PHYS 101, 115, BBMB 221, or AGRON 259	3-4
MATH 140	3 ENT 376	3
ACCT 284	3 Elective	3
HORT 331	2	
Elective	1	
	<b>15</b>	<b>16-17</b>



Junior			Junior		
Fall	Credits Spring	Credits	Fall	Credits Spring	Credits
HORT 434	3 ENT 375	3	HORT 331	2 Biological Science	3
HORT 321	3 ENTSP 310	3	HORT 321	3 HORT 332	4
HORT 391	1 HORT 322	3	HORT 391	1 HORT 322	3
PL P 408	3 CHEM 231 & 231L or BBMB 221	3-4	Humanities	3 HORT 461	3
Elective	3 International Perspective	3	CHEM 231 & 231L or BBMB 221	3-4 Elective	3
US Diversity	3 Elective	1	Elective	3	
	<b>16</b>	<b>16-17</b>		<b>15-16</b>	<b>16</b>
Senior			Senior		
Fall	Credits Spring	Credits	Fall	Credits Spring	Credits
HORT 321	3 HORT 435	3	ENTSP 310	3 ENGL 302 or 314	3
HORT 391	1 ECON 334	3	HORT 391	1 ECON 334	3
ECON 234	3 Humanities	3	ECON 234	3 PL P 408	3
Ethics	3 HORT 341	2	HORT 476	3 Ethics	3
SP CM 212 or AGEDS 311	3 ENGL 302 or 314	3	HORT 331	2 US Diversity	3
Elective	3 Elective	2	SP CM 212 or AGEDS 311	3 Elective	1
	<b>16</b>	<b>16</b>	Elective	1	
				<b>16</b>	<b>16</b>

**Horticulture, B.S. - Horticulture Food Crop Production and Management Option**

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 ENGL 250	3
CHEM 163	4 BIOL 211	3
CHEM 163L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

Sophomore		
Fall	Credits Spring	Credits
ENT 201	1 AGRON 282	3
ENT 211	2 HORT 276	3
HORT 376	3 PHYS 101, 131, 115, BBMB 221, or AGRON 259	3-4
MATH 140	3 ENT 376	3
ACCT 284	3 HORT 471	2
International Perspective	3 HORT 471L	1
Elective	1 Elective	1
	<b>16</b>	<b>16-17</b>

**Horticulture, B.S. - Landscape Design, Installation, and Management**

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 ENGL 250	3
CHEM 163	4 BIOL 211	3
CHEM 163L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

Sophomore		
Fall	Credits Spring	Credits
ENT 201	1 AGRON 282	3
ENT 211	2 HORT 380	2
HORT 330	3 PHYS 101, 131, 115, BBMB 221, or AGRON 259	3-4
MATH 140	3 ENT 376	3
ACCT 284	3 HORT 381	2
HORT 281	2 Elective	3

HORT 444	3		Elective	1	
	<b>17</b>	<b>16-17</b>		<b>16</b>	<b>15-16</b>
<b>Junior</b>			<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>	<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
HORT 240	3 BIOL 355	3	HORT 330	3 BIOL 355	3
HORT 321	3 CHEM 231 & 231L or BBMB 221	3-4	HORT 321	3 CHEM 231 & 231L or BBMB 221	3-4
HORT 391	1 International Perspective	3	HORT 391	1 HORT 424	3
HORT 481	2 US Diversity	3	SP CM 212 or AGEDS 311	3 Elective	3
SP CM 212 or AGEDS 311	3 HORT 341	2	P R 220	3 US Diversity	3
ECON 234	3 HORT 342	3	Elective	3 Elective	1
	<b>15</b>	<b>17-18</b>		<b>16</b>	<b>16-17</b>
<b>Senior</b>			<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>	<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENTSP 310	3 ENGL 302 or 314	3	ENGL 309	3 ENGL 302 or 314	3
HORT 391	1 Humanities	3	PL P 408	3 Elective	3
ECON 334	3 Ethics	3	HORT 391	1 Humanities	3
Elective	3 PL P 408	3	JL MC 201	3 HORT 332	4
MGMT 371	3 HORT 322	3	Ethics	3 HORT 342	3
HORT 351	3 Elective	1	MGMT 371	3	
	<b>16</b>	<b>16</b>		<b>16</b>	<b>16</b>

***Horticulture, B.S. - Public Horticulture Option***

<b>Freshman</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 150	3 ENGL 250	3
CHEM 163	4 BIOL 211	3
CHEM 163L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

<b>Sophomore</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENT 201	1 AGRON 282	3
ENT 211	2 HORT 322	3
HORT 240	3 PHYS 101, 131, 115, BBMB 221, or AGRON 259	3-4
MATH 140	3 ENT 376	3
ACCT 284	3 Elective	3
International Perspective	3	

***Horticulture, B.S. - Horticulture Research Option***

<b>Freshman</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 150	3 ENGL 250	3
CHEM 177	4 BIOL 211	3
CHEM 177L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

<b>Sophomore</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 212	3 US Diversity	3
BIOL 212L	1 HORT 332	4
HORT 240	3 MATH 166	4
MATH 165	4 PHYS 131	4
CHEM 178	3 PHYS 131L	1
CHEM 178L	1	
	<b>15</b>	<b>16</b>

Junior			Junior		
Fall	Credits Spring	Credits	Fall	Credits Spring	Credits
PHYS 132	4 ENT 376	3	HORT 453	3 AGRON 354	3
PHYS 132L	1 BIOL 313	3	HORT 321	3 ENT 376	3
HORT 321	3 BIOL 313L	1	HORT 391	1 HORT 451	2
HORT 391	1 HORT 322	3	PL P 408	3 HORT 322	3
PL P 408	3 CHEM 331	3	International Perspective	3 Elective	2
AGEDS 312	3 CHEM 331L	1	US Diversity	3 CHEM 231 & 231L or BBMB 221	3-4
HORT 342	3 International Perspective	3			
	<b>18</b>	<b>17</b>		<b>16</b>	<b>16-17</b>
Senior			Senior		
Fall	Credits Spring	Credits	Fall	Credits Spring	Credits
CHEM 332	3 BIOL 314	3	AGRON 206	3 ENGL 302 or 314	3
CHEM 332L	1 BIOL 430	3	HORT 391	1 HORT 342	3
HORT 391	1 Humanities	3	HORT 454	3 HORT 424	3
BBMB 301, 404, or 316	3 Ethics	3	Option Class	3 Ethics	3
ENGL 302 or 314	3 HORT 330	3	MGMT 371	3 Option Class	3
SP CM 212 or AGEDS 311	3 Elective	1	Option Class	3 Elective	1
Elective	2			<b>16</b>	<b>16</b>
	<b>16</b>	<b>16</b>			

### **Horticulture, B.S. - Turfgrass Management Option**

#### **Freshman**

Fall	Credits Spring	Credits
ENGL 150	3 ENGL 250	3
CHEM 163	4 BIOL 211	3
CHEM 163L	1 BIOL 211L	1
ECON 101	3 STAT 104	3
HORT 121	3 AGRON 182	3
LIB 160	1 HORT 221	3
HORT 110	1	
	<b>16</b>	<b>16</b>

#### **Sophomore**

Fall	Credits Spring	Credits
ENT 201	1 AGRON 282	3
ENT 211	2 Humanities	3
HORT 240	3 PHYS 101, 131, 115, BBMB 221, or AGRON 259	3-4
MATH 140	3 HORT 551	2
ACCT 284	3 SP CM 212 or AGEDS 311	3
HORT 351	3 Elective	3
HORT 351L	1	
	<b>16</b>	<b>17-18</b>

## **Minors**

The Department of Horticulture offers two minors: 1) Horticulture and 2) Landscape Management. Both minors are earned by taking HORT 221 Principles of Horticulture Science plus 12 additional credits with a maximum of 3 credits at the 200-level and a minimum of 9 credits at the 300-level or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

### **Horticulture minor**

The Horticulture minor is a broad-based minor that does not focus within a specific area of horticulture. The 12 additional credits for this minor can be selected from the full list of Horticulture courses.

### **Landscape Management minor**

The Landscape Management minor focuses on landscape management including plant selection, landscape installation and management, and turfgrass management. The 12 additional credits for this minor can be selected from the following courses: HORT 240 Trees, Shrubs, and Woody Vines for Landscaping, HORT 281 Landscape Graphics, HORT 330 Herbaceous Ornamental Plants, HORT 341 Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs, HORT 342 Landscape Plant Installation, Establishment, and Management, HORT 351 Turfgrass Establishment and Management or HORT 444 Landscape Construction Management.

## Graduate Study

The graduate major in horticulture leads to the M.S. (thesis and non-thesis option) and Ph.D. Some faculty members of the department serve as major professors for students in interdepartmental graduate majors in plant biology; genetics and genomics; molecular, cellular, and developmental biology; ecology and evolutionary biology; sustainable agriculture; and environmental science.

Graduates possess a broad understanding of horticulture and the allied plant sciences. They are able to communicate effectively with members of the scientific community, industry groups, and other interested citizens. They are experienced in conducting research and communicating the results from that research. They are capable of addressing and solving complex problems that confront the many horticultural, agricultural, and plant science professions. They also understand the ethical, legal, social, and environmental issues associated with modern agricultural/horticultural practices.

## Industrial Technology

The Department of Agricultural and Biosystems Engineering offers a bachelor of science degree in Industrial Technology (ITEC), as well as an undergraduate certificate in Occupational Safety. Students majoring in ITEC choose between three options: Biological and Biomanufacturing Systems Technology, Manufacturing or Occupational Safety. The department also offers a minor in Industrial Technology.

Successful ITEC graduates gain knowledge, skills, and abilities in solving technical problems, understanding the design process, excelling in authentic leadership, being aware of safety issues, having a quality orientation, effectively managing projects, and having a systems-thinking perspective. This translates to a holistic approach that uses science and engineering principles to focus on the way the constituent parts of a manufacturing system interrelate, how they work over time, and how they fit the context of larger systems. Graduates find careers within a variety of industries, businesses, and organizations in the fields of advanced manufacturing and biomanufacturing; robotics; analytical and processing laboratories; automation and controls; biofuel and beverage fermentation systems electronics; lean manufacturing; quality and operations management; safety management, loss prevention; or industrial hygiene.

Common job duties of ITEC Biological and Biomanufacturing Systems Technology graduates include:

- Implementation, management, and documentation of analytical protocols
- Technical project management

- Implement, manage, and maintain instrumentation and equipment
- Manage bioprocessing and biotechnology systems

Common job duties of ITEC Manufacturing graduates include:

- Quality management
- Production supervision
- Product process design
- Facility planning and management

Common job duties of ITEC Occupational Safety graduates include:

- Development, management, and evaluation of safety programs and systems
- Hazard identification and mitigation
- Loss prevention

The certificate in occupational safety is designed to meet the needs of the students who will find themselves in management roles with responsibilities that include safety. The certificate program prepares technically-oriented managers to meet their professional safety responsibilities.

For more information about the Industrial Technology degree: <http://www.abe.iastate.edu/undergraduate-students/industrial-technology/>

For more information about the occupational safety certificate: <http://www.abe.iastate.edu/home/certificate-in-occupational-safety/>

## Student Learning Outcomes

Upon graduation, all ITEC students should be able to:

1. Apply knowledge of mathematics, science, computation, and applied engineering to identify and solve applied science and technology problems
2. Develop and conduct experiments, and analyze and interpret resulting data
3. Evaluate and adapt systems, processes and programs to meet desired needs
4. Function effectively on multi-disciplinary teams
5. Communicate effectively, ethically, and professionally in written, oral, and other formats to technical and non-technical audiences
6. Understand the potential impacts and limitations of solutions in global and societal contexts
7. Recognize the need for, and demonstrate an ability to, engage in life-long learning
8. Effectively apply modern scientific and technical tools necessary for professional practice to address contemporary issues in applied engineering and technology

Upon graduation, ITEC students in the biological and biomanufacturing systems technology (BBST) option should be able to:

1. Develop, implement, troubleshoot, and evaluate bio-based manufacturing processes, facilities, and products
2. Calculate and interpret mass and energy balances of biological processes involving microbial growth and conversion, plants, animals, and humans to optimize processing and production systems
3. Calculate and interpret rates of biological processes involving reaction kinetics, growth, death, heat production, and transpiration to optimize processing and production systems.

Upon graduation, ITEC students in the manufacturing (M) option should be able to:

1. Create, implement, and evaluate manufacturing processes and facility plans
2. Integrate and apply tools in computer aided design, manufacturing, controls, robotics, and automation systems to applied engineering and technology management settings
3. Evaluate technologies to enhance production, quality, sustainability, and profitability of manufacturing systems and facility management

Upon graduation, ITEC students in the occupational safety (OS) option should be able to:

1. Design, implement, and evaluate occupational safety and health programs for work environments
2. Identify, assess, and analyze hazards and loss-producing conditions in work environments
3. Eliminate or control occupational hazards using appropriate technologies, training, and administrative interventions

Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### Communications Proficiency:

6 cr. of English composition with a C or better and 3 cr. of speech fundamentals with a C or better.

### Communication/Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	

AGEDS 327	Survey of Agriculture and Life Sciences Communication	
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
COMST 214	Professional Communication	
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
<b>Total Credits</b>		<b>13</b>

### Mathematical, Physical, and Life Sciences: 25 cr.

STAT 104	Introduction to Statistics	3
MATH 145	Applied Trigonometry	3
MATH 151	Calculus for Business and Social Sciences	3
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
One of the following:		3
BIOL 101	Introductory Biology	
BIOL 211	Principles of Biology I	
BIOL 212	Principles of Biology II	
BIOL 251	Biological Processes in the Environment	
Second Biology course requirement by Option:		3
Manufacturing option		
Life Sciences Elective from approved College of Agriculture and Life Sciences list		
Occupational Safety option		
BIOL 255	Fundamentals of Human Anatomy	
<b>Total Credits</b>		<b>25</b>

### Business, Humanities, Ethics, and Social Sciences: 18 cr.

Occupational safety option must take ACCT 215

ACCT 284	Financial Accounting	3
or ACCT 215	Legal Environment of Business	
ECON 101	Principles of Microeconomics	3
TSM 370	Occupational Safety (Ethics)	3
Humanities course from College of Agriculture and Life Sciences list		3
International Perspectives course from University list		3
U.S. Diversity course from University list		3
<b>Total Credits</b>		<b>18</b>

### Technical Core: 28 cr.

TSM 110	Introduction to Technology	1
TSM 111	Experiencing Technology	1
TSM 115	Solving Technology Problems	3

TSM 116	Introduction to Design in Technology	3
TSM 201	Preparing for Workplace Seminar	1
TSM 210	Fundamentals of Technology	3
TSM 214	Managing Technology Projects	1
TSM 270	Principles of Injury Prevention and Safety	3
TSM 310	Total Quality Improvement	3
TSM 363	Electrical Power and Control Systems for Agriculture and Industry	4
TSM 397 or TSM 399	Summer Internship in Technology Internship in Technology	R
TSM 415	Applied Project Management in Technology	2
TSM 416	Technology Capstone	3
<b>Total Credits</b>		<b>28</b>

**TSM 397 or TSM 399 may count toward graduation.  
Manufacturing Option: 36 cr.**

One of the following:		1
A B E 271	Engineering Applications of Parametric Solid Modeling	
A B E 272	Parametric Solid Models, Drawings, and Assemblies Using Creo Parametric	
A B E 273	CAD for Process Facilities and Land Use Planning	
TSM 216	Advanced Technical Graphics, Interpretation, and CAD	2
TSM 240	Introduction to Advanced Manufacturing and Metals Processing	3
TSM 241	Introduction to Manufacturing Processes for Plastics	2
TSM 337	Fluid Power Systems Technology	3
TSM 340	Advanced Automated Manufacturing Processes	3
TSM 440	Cellular Lean Manufacturing Systems	3
TSM 443	Statics and Strength of Materials for Technology	3
TSM 444	Facility Planning	3
TSM 449	Applied Nondestructive Testing and Evaluation.	3
TSM 465	Automation Systems	3
7 credits of free electives		7
Total Credits		36

**Occupational Safety Option: 36 cr.**

TSM 240	Introduction to Advanced Manufacturing and Metals Processing	3
TSM 371	Occupational Safety Management	2
TSM 372	Legal Aspects of Occupational Safety and Health	2
TSM 376	Fire Protection and Prevention	3

TSM 470	Industrial Hygiene: Physical, Chemical, and Biological Hazards	3
TSM 471	Safety Laboratory	1
TSM 477	Risk Analysis and Management	3
H S 105	First Aid and Emergency Care	2
PSYCH 250	Psychology of the Workplace	3
14 credits of free electives		14
<b>Total Credits</b>		<b>36</b>

**Biological and Biomanufacturing Systems Technology Option: 36 cr.**

BIOL 212	Principles of Biology II	3
CHEM 211	Quantitative and Environmental Analysis	2
CHEM 211L	Quantitative and Environmental Analysis Laboratory	2
LD ST 322	Leadership in a Diverse Society	3
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1
TSM 380	Fundamentals, Applications, and Modeling of Biological Systems	3
Select 15 credits from departmental list		15
5 credits of free electives		5
<b>Total Credits</b>		<b>36</b>

**Industrial Technology, B.S. - manufacturing option**

**First Year**

Fall	Credits	Spring	Credits
TSM 110	1	TSM 111	1
TSM 116	3	TSM 115	3
ENGL 150	3	MATH 151	3
LIB 160	1	PHYS 131	4
MATH 145	3	PHYS 131L	1
CHEM 163	4	ECON 101	3
CHEM 163L	1		
<b>16</b>		<b>15</b>	

**Second Year**

Fall	Credits	Spring	Credits
TSM 201	1	TSM 216	2
TSM 210	3	TSM 241	2
TSM 214	1	STAT 104	3
TSM 240	3	BIOL 101 or 211	3



TSM 270	3 International Perspectives - See list*	3			
ENGL 250	3 SP CM 212, COMST 214, or AGEDS 311	3			
<b>14</b>		<b>16</b>			
<b>Third Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>	<b>Summer</b>	<b>Credits</b>
TSM 340	3 TSM 310			3 TSM 397 or 399	R
TSM 363	4 TSM 337			3	
ACCT 284 or 215	3 TSM 370 (Ethics requirement)			3	
US Diversity - See list*	3 A B E 271, 272, or 273			1	
ENGL 302, 309, 314, or AGEDS 327	3 Humanities - See list*			3	
	Life Science - See list*			3	
<b>16</b>		<b>16</b>			<b>0</b>
<b>Fourth Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>		
TSM 415	2 TSM 416			3	
TSM 440	3 TSM 444			3	
TSM 443	3 TSM 465			3	
TSM 449	3 Elective			4	
Elective	3				
<b>14</b>		<b>13</b>			

\* International Perspectives course list (<https://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)  
 US Diversity course list (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)  
 Humanities course list (<https://www.cals.iastate.edu/student-services/humanities/>)  
 Life Science course list (<https://www.cals.iastate.edu/student-services/life-science/>)

## Industrial Technology, B.S. - occupational safety option

<b>First Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>		
TSM 110		1 TSM 111		1	
TSM 116		3 TSM 115		3	
ENGL 150		3 MATH 151		3	
LIB 160		1 PHYS 131		4	
MATH 145		3 PHYS 131L		1	
CHEM 163		4 ECON 101		3	
CHEM 163L		1			
<b>16</b>		<b>15</b>			
<b>Second Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>		
TSM 201		1 TSM 240		3	
TSM 214		1 TSM 371		2	
TSM 210		3 H S 105		2	
TSM 270		3 STAT 104		3	
ENGL 250		3 SP CM 212, COMST 214, or AGEDS 311		3	
BIOL 251		3 BIOL 255		3	
<b>14</b>		<b>16</b>			
<b>Third Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>	<b>Summer</b>	<b>Credits</b>
TSM 363		4 TSM 310		3 TSM 397 or 399	R
TSM 372		2 TSM 370		3	
TSM 376		3 TSM 471		1	
ENGL 302, 309, 314, or AGEDS 327		3 TSM 470		3	
Elective		3 ACCT 215		3	
		International Perspectives*		3	
<b>15</b>		<b>16</b>			<b>0</b>
<b>Fourth Year</b>					
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>		
TSM 415		2 TSM 416		3	
TSM 477		3 US Diversity*		3	
PSYCH 250		3 Humanities*		3	

Elective	6 Elective	5
	<b>14</b>	<b>14</b>

\* International Perspectives course list (<https://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)  
 U.S. Diversity course list (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)  
 Humanities course list (<https://www.cals.iastate.edu/student-services/humanities/>)  
 Life Science course list (<https://www.cals.iastate.edu/student-services/life-science/>)

## Industrial Technology, B.S. - biological and biomanufacturing systems technology option

### First Year

Fall	Credits	Spring	Credits
TSM 110	1	TSM 111	1
TSM 116	3	TSM 115	3
ENGL 150	3	MATH 151	3
LIB 160	1	PHYS 131	4
MATH 145	3	PHYS 131L	1
CHEM 163	4	ECON 101	3
CHEM 163L	1		
	<b>16</b>		<b>15</b>

### Second Year

Fall	Credits	Spring	Credits
TSM 201	1	CHEM 211	2
TSM 214	1	CHEM 211L	2
TSM 210	3	STAT 104	3
BIOL 211	3	BIOL 212	3
TSM 270	3	LD ST 322	3
ENGL 250	3		
	<b>14</b>		<b>13</b>

### Third Year

Fall	Credits	Spring	Credits	Summer	Credits
TSM 310	3	TSM 380	3	TSM 397 or 399	R
TSM 363	4	MICRO 201	2		
ACCT 284 or 215	3	MICRO 201L	1		
Speech Communication - See list*	3	TSM 370 (Ethics requirement)	3		

Option core course - See list*	3 Humanities - See list*	3
	International Perspectives - See list*	3
	<b>16</b>	<b>15</b>
		<b>0</b>

### Fourth Year

Fall	Credits	Spring	Credits
Option core course - See list*	3	TSM 416	3
TSM 415	2	Advanced English - See list*	3
Option core course - See list*	3	Option core course - See list*	3
Option core course - See list*	3	Option core course - See list*	3
Elective	4	Elective	4
	<b>15</b>		<b>16</b>

\* International Perspectives course list (<https://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)  
 U.S. Diversity course list (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)  
 Humanities course list (<https://www.cals.iastate.edu/student-services/humanities/>)  
 Option core course list

## Minor - Industrial Technology

The Department of Agricultural and Biosystems Engineering offers a minor in industrial technology which may be earned by completing a minimum of 15 credits of technology systems management (TSM) courses, which includes:

TSM 115	Solving Technology Problems	3
TSM 210	Fundamentals of Technology	3
9 credits from:		9
TSM 216	Advanced Technical Graphics, Interpretation, and CAD	
TSM 240	Introduction to Advanced Manufacturing and Metals Processing	

TSM 241	Introduction to Manufacturing Processes for Plastics	
TSM 270	Principles of Injury Prevention and Safety	
TSM 310	Total Quality Improvement	
TSM 337	Fluid Power Systems Technology	
TSM 340	Advanced Automated Manufacturing Processes	
TSM 363	Electrical Power and Control Systems for Agriculture and Industry	
TSM 370	Occupational Safety	
TSM 371	Occupational Safety Management	
TSM 372	Legal Aspects of Occupational Safety and Health	
TSM 376	Fire Protection and Prevention	
TSM 440	Cellular Lean Manufacturing Systems	
TSM 443	Statics and Strength of Materials for Technology	
TSM 444	Facility Planning	
TSM 449	Applied Nondestructive Testing and Evaluation.	
TSM 465	Automation Systems	
TSM 470	Industrial Hygiene: Physical, Chemical, and Biological Hazards	
TSM 471	Safety Laboratory	
TSM 477	Risk Analysis and Management	
• At least six (6) credits of 300-level or higher TSM classes (from the courses listed above)		
• At least nine (9) credits that are not used to meet any other department, college, or university requirement.		

**Total Credits****15**

For the undergraduate curriculum in agricultural systems technology leading to the degree of bachelor of science or for the undergraduate curriculum in industrial technology leading to the degree of bachelor of science.

The department also offers an undergraduate curricula and courses in agricultural engineering, biological systems engineering.

## Certificate in Occupational Safety

The Department of Agricultural and Biosystems Engineering offers a undergraduate certificate in occupational safety (<http://www.abe.iastate.edu/undergraduate-students/industrial-technology/certificate-in-occupational-safety/>) which may be earned by completing a minimum of 20 credits of technology systems management courses, which includes:

TSM 270	Principles of Injury Prevention and Safety	3
TSM 370	Occupational Safety	3
TSM 371	Occupational Safety Management	2

TSM 372	Legal Aspects of Occupational Safety and Health	2
TSM 470	Industrial Hygiene: Physical, Chemical, and Biological Hazards	3
6 credits from a departmentally approved list		6
TSM 493D	Workshop in Technology: Occupational Safety (Note: This course needs to be the last course taken toward completion of the Occupational Safety Certificate)	1-4

## International Agriculture Interdepartmental Undergraduate Program

The international agriculture program provides opportunities to develop knowledge and skills related to the factors that interact to impact agricultural and environmental issues, production, processes, distribution and utilization worldwide. The program puts emphasis on international experience through structured internships and study abroad. The international agriculture program is appropriate for students seeking positions that require knowledge and experience related to global agricultural issues and their impact on local, regional, national and international policies and practices. Students preparing for careers in the following areas will benefit from the international agriculture program; governmental and non-governmental development agencies, agribusinesses, educational institutions, and non-profit assistance agencies. Outcomes from participation in this program include developing an awareness for the role of international agriculture in the career development process, analyzing international agricultural issues and policies, acquiring skills for solving problems in international development and agribusiness and experiencing real situations and gaining perspectives about agriculture in a global setting.

### International Agriculture as Secondary Major

International agriculture is an undergraduate secondary major that may be taken only in conjunction with a primary major in an agriculture and life sciences curriculum. Students choosing international agriculture will strengthen their career placement with a business or agency involved in international activities. Technical knowledge of a primary major discipline will be strengthened by a global awareness of agriculture and life sciences. A secondary major in international agriculture will give students practical insight into the role of agriculture in a world of increasing food and fiber needs. It is ideal for those who wish to broaden their international perspective or prepare for international work in agriculture. The secondary major includes an emphasis on international internship or study abroad and/or foreign languages, and selection of appropriate courses (from an approved list) to meet the needs and interests of the student.

Courses for the secondary major include AGRON 342 World Food Issues: Past and Present; six credits of study abroad, travel, or language courses or any combination thereof; and six credits in selected international agriculture courses in the College of Agriculture and Life Sciences. Fifteen credits of the secondary major cannot be used to meet requirements of the major or any other college or university requirement.

Students interested in earning a secondary major in international agriculture must contact a program advisor. The early indication of an interest in international agriculture allows for effective integration of the secondary major course requirements with those of the primary major.

## Student Learning Outcomes

Students pursuing International Agriculture Secondary Major will be able to:

1. Develop an awareness for the role of international agriculture in their career development process.
2. Improve knowledge of international agriculture within the context of College of Agriculture and Life Sciences degree programs.
3. Analyze international agricultural issues and policies and acquire skills for solving problems in international development and agribusiness.
4. Experience real life situations and gain perspectives about agriculture in a global setting.
5. Enhance understanding and analysis of global agricultural issues at home and abroad.

## Curriculum in International Agriculture

Administered by an Interdepartmental Committee. International agriculture can be taken only as a secondary major in conjunction with a primary major in the College of Agriculture and Life Sciences. A minor is available to interested students regardless of their major.

15 cr. of this major cannot be used to meet requirements of the primary major or any other college or university requirements.

6 cr. from Internship in International Agriculture or Study Abroad or World Languages and Cultures; AGRON 342 World Food Issues: Past and Present; credits from approved International Agriculture Courses to total 15 cr.

## Minor

A minor in international agriculture is available to interested students regardless of their major. Students selecting the minor should have at least minimal familiarity with agriculture and life sciences and agricultural systems.

Courses for the minor include AGRON 342 World Food Issues: Past and Present; 3 to 6 credits of study abroad and/or foreign language and 3 to

6 credits in selected international agriculture courses in the College of Agriculture and Life Sciences. The minor requires 15 credits and must include at least 9 credits that are not used to meet any other department, college, or university requirement.

For more information about a secondary major or minor in international agriculture, see descriptions in the designated departments or the supervisory committee.

For more information about courses for either a secondary major or a minor in international agriculture, see descriptions in the designated departments.

## Learning and Leadership Sciences Minor

### Learning and Leadership Sciences Minor

The Learning and Leadership Sciences minor provides an opportunity for students to engage in productive thinking, enabling them to lead in their professions and contribute to society and their communities.

The coursework builds on the curriculum of a student's primary discipline to enhance student leadership abilities throughout their academic career and beyond. Students will enhance their abilities to engage in productive thinking, such as critical, analytical, and creative thinking in problem-solving; discern the types of thinking required when presented with new situations; and use different types of thinking to address issues and situations as professionals and citizens. Core courses in the minor address eight competency areas that are critical for leaders: 1) understanding self and personal responsibility for learning, 2) understanding worthy team membership, 3) developing productive thinking and creative problem solving abilities, 4) developing resiliency, 5) negotiating and resolving conflict, 6) action planning for providing service, 7) communicating, and 8) recognizing and acting on the obligation to "do" leadership every day.

Students in the Learning and Leadership Sciences Minor will ultimately achieve these learning outcomes by uncovering and practicing:

- habits of deep self-reflection about learning and application of these habits to their professional and community lives;
- effective interaction with others in professional and community settings, including abilities to listen actively, communicate clearly, resolve conflicts, and negotiate desired outcomes;
- habits of professional thinking, including accountability, initiative, innovation, resilience, tolerance, and profound respect for others.

L L S 112 Foundations of Learning and Productive Team Membership 2

L L S 114	Developing Responsible Learners and Effective Leaders	2
L L S 212	Habits of Mind and Decision-Making in Leadership	2
L L S 312	Problem Solving and Action Planning in Leadership	3
L L S 412	Learning and Leadership in Practice	3
At least three additional credits from the following courses (or others) as per personal plan of study:		
AESHM 211	Leadership Experiences and Development (LEAD)	3
AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
FS HN 342	World Food Issues: Past and Present	3
HD FS 270	Family Communications and Relationships	3
MGMT 371	Organizational Behavior	3
M S 202L	Basic Leadership Laboratory IV	1
NREM 460	Controversies in Natural Resource Management	3
PSYCH 230	Developmental Psychology	3
PSYCH 280	Social Psychology	3
PSYCH 310	Brain and Behavior	3
PSYCH 313	Learning and Memory	3
SOC 305	Social Psychology: A Sociological Perspective	3
SOC 330	Ethnic and Race Relations	3
SOC 464	Strategies for Community Engagement	3

- Degrees in microbiology at both the undergraduate (B.S.) level and graduate (M.S., PhD., see Graduate Major) level

## Career opportunities:

Opportunities after graduation include the following:

- Biomedical research scientist
- Biotechnology firms
- Biorenewables industry
- Forensic scientist
- Pharmaceutical and vaccine development companies
- Immunologist
- Agricultural microbiology and plant pathology
- International agricultural research centers
- Government laboratories (CDC, NADC, USDA)
- Infectious disease
- Food safety and food technology
- Water quality
- Ecology and environmental microbiology
- Botanical gardens & nurseries
- Technical brewer
- Science writer
- Public health agencies
- Public policy organizations

# Microbiology

## Undergraduate Microbiology Major

Interested in the study of small things that have a big impact? Then Microbiology may be the place for you.

Our mission in the Microbiology Program is to instill a comprehensive understanding of microbiology and its relevance to human society and global health, and to cultivate the concepts and skills necessary to succeed in microbiology-related careers.

Iowa State University's Microbiology Undergraduate Program offers:

- Extensive hands-on laboratory experiences that develop problem solving & technical skills used in a variety of professional careers
- Application of science to issues in the modern world
- Excellent preparation for human medicine and veterinary medicine
- Preparation for employment in a variety of professional settings
- Research opportunities and interaction with professors from across Iowa State University Departments of Animal Science, Plant Pathology and Microbiology, Biochemistry & Molecular Biology, Biology, Veterinary Microbiology, Veterinary Pathology, Food Science, Entomology, and Geology

Interested in Human medicine or Veterinary medicine? A microbiology degree prepares students for advanced study in Dentistry, Medical Laboratory Science, Optometry, Pharmacy, Physician Assistant Programs, and Physician or Veterinary education. Go to [micro.iastate.edu](https://www.micro.iastate.edu/) (<https://www.micro.iastate.edu/>) to find more information about the Microbiology Program.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Research and critically evaluate topics in microbiology; understand and communicate results from primary and secondary literature to a variety of audiences.
2. Utilize appropriate quantitative and qualitative microbiological laboratory techniques and equipment, including microscopy, biochemical tests, serological assays, and genetic manipulation.
3. Explain how evolution unifies and explains the diversity of microbes in terms of microbial structure, function, metabolism, and genetics.
4. Describe common adaptations that enable organisms to survive in an ecological niche, such as how microbiota can impact plants,

animals/humans, food, and soil health in beneficial, neutral, or negative ways.

5. Develop and follow lab protocols, interpret data, maintain an accurate lab notebook, and create illustrative graphs and tables.

6. Communicate and collaborate across disciplines about fundamental concepts in microbiology and discuss the relationship of science, society, and ethical issues in microbiology.

## Curriculum in Microbiology

[www.micro.iastate.edu](http://www.micro.iastate.edu) (<http://www.micro.iastate.edu>)

Administered by an interdepartmental committee.

### Total Degree Requirement: 128 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### International Perspective: 3 cr.

International Perspectives Courses (<https://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>)

### U.S. Diversity: 3 cr.

U.S. Diversity Courses (<https://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>)

### Electives: 7-12

#### Communications Proficiency:

English composition - with a C or better	6
Speech fundamentals - with a C or better	3

#### Communication/Library:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
SP CM 212	Fundamentals of Public Speaking	3
One course from the following:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 312	Communicating Science and Public Engagement	
ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1

**Total Credits** 13

### Humanities and Social Sciences:

Approved Humanities list <sup>1</sup>	3
Approved Social Science list <sup>2</sup>	3

<sup>1</sup> Humanities Course list (<https://www.cals.iastate.edu/student-services/humanities/>)

<sup>2</sup> Social Sciences Course list (<https://www.cals.iastate.edu/student-services/social-sciences/>)

### Ethics: 3 cr.

3 cr. from approved Ethics Course list (<https://www.cals.iastate.edu/student-services/ethics/>)

### Mathematical Sciences:

One of the following: 7-8

MATH 143 & MATH 160	Preparation for Calculus and Survey of Calculus
MATH 165 & MATH 166	Calculus I and Calculus II
MATH 160 & STAT 301	Survey of Calculus and Intermediate Statistical Concepts and Methods

One of the following: 3-4

STAT 101	Principles of Statistics
STAT 104	Introduction to Statistics

**Total Credits** 10-12

### Physical Sciences:

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
One of the following:		5-10

PHYS 115 & 115L	Physics for the Life Sciences and Laboratory in Physics for the Life Sciences
PHYS 131 & 131L & PHYS 132 & PHYS 132L	General Physics I and General Physics I Laboratory and General Physics II and General Physics II Laboratory

CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
CHEM 332	Organic Chemistry II	3
One of the following:		3-6

BBMB 404 & BBMB 405	Biochemistry I and Biochemistry II
or BBMB 301Survey of Biochemistry	
or BBMB 316Principles of Biochemistry	

**Total Credits** 23-31

### Biological Sciences:

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1



BIOL 313	Principles of Genetics	3
BIOL 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
<b>Total Credits</b>		<b>15</b>

**Microbiology:**

Core courses:

MICRO 110	Professional and Educational Preparation in Microbiology	1
MICRO 302	Biology of Microorganisms	3
MICRO 302L	Microbiology Laboratory	1
MICRO 310	Medical Microbiology	3
One of the following:		1

MICRO 310L	Medical Microbiology Laboratory	
MICRO 475L	Immunology Laboratory	
MICRO 320	Molecular and Cellular Bacteriology	4
MICRO 440	Laboratory in Microbial Physiology, Diversity, and Genetics	4
MICRO 450	Undergraduate Capstone Colloquium	2
MICRO 451	Survey in Microbiology	R

One of the following:		3
MICRO 430	Prokaryotic Diversity and Ecology	
MICRO 456	Principles of Mycology	
MICRO 477	Bacterial-Plant Interactions	

Additional nine credit hours from the following: 9

MICRO 353	Introductory Parasitology	
MICRO 374	Insects and Our Health	
MICRO 374L	Insects and Our Health Laboratory	
MICRO 402	Microbial Genetics and Genomics	
MICRO 407	Microbiological Safety of Foods of Animal Origins	
MICRO 408	Virology	
MICRO 420	Food Microbiology	
MICRO 421	Food Microbiology Laboratory	
MICRO 430	Prokaryotic Diversity and Ecology	
MICRO 456	Principles of Mycology	
MICRO 475	Immunology	
MICRO 475L	Immunology Laboratory	
MICRO 477	Bacterial-Plant Interactions	
MICRO 485	Soil and Environmental Microbiology	
MICRO 487	Microbial Ecology	
MICRO 490	Independent Study	

Microbiology elective - only 3 cr. lab courses allowed

**Total Credits 31**

Microbiology, B.S.

**First Year**

Fall	Credits Spring	Credits
ENGL 150 or 250	3 MICRO 302	3
MICRO 110	1 MICRO 302L	1
MICRO 101	3 BIOL 212	3
BIOL 211	3 BIOL 212L	1
BIOL 211L	1 CHEM 178	3
CHEM 177	4 STAT 104	3
CHEM 177L	1 Social Science choice	3
LIB 160	1	
<b>17</b>		<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
MICRO 310	3 MICRO Environmental or Elective	3
MICRO 310L	1 BIOL 313	3
CHEM 331	3 BIOL 313L	1
CHEM 331L	1 CHEM 332	3
MATH 143, 160, or 165	4 MATH 160, STAT 301, or MATH 166	4
ENGL 250	3 Humanities choice	3
<b>15</b>		<b>17</b>

**Third Year**

Fall	Credits Spring	Credits
MICRO Environmental or Elective	3 MICRO 320	4
PHYS 131 or 115	4 PHYS 132 (if PHYS 131 previously taken)	4
PHYS 131L or 115L	1 PHYS 132L (if PHYS 131L previously taken)	1
BIOL 314 or 328	3 Advanced English	3
SP CM 212	3 International Perspectives	3
Gen Elective	3	
<b>17</b>		<b>15</b>

**Fourth Year**

Fall	Credits Spring	Credits
MICRO 440	4 MICRO elective	3
MICRO elective	3 MICRO 450	2
MICRO 451	R BBMB 405	3
ETHICS choice	3 Social Science choice	3
BBMB 404	3 Gen Electives	5

## Minor

The program offers a minor in microbiology which may be earned by accumulating a minimum of 15 credits of microbiology courses.

Students requesting a minor in Microbiology must take the following:

1) MICRO 201 Introduction to Microbiology and MICRO 201L Introductory Microbiology Laboratory or MICRO 302 Biology of Microorganisms and MICRO 302L Microbiology Laboratory

2) Additional lecture credits and no more than 3 additional lab credits to reach 15 credits. For a list of acceptable courses see [https://www.micro.iastate.edu/files/inline-files/minor\\_in\\_microbiology\\_21-22\\_1.pdf](https://www.micro.iastate.edu/files/inline-files/minor_in_microbiology_21-22_1.pdf)

3) At least 6 credits at the 300+ level and must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Graduate Study

The program offers work for the degrees master of science and doctor of philosophy in microbiology and for a minor for students majoring in other programs. The interdepartmental microbiology major is offered through faculty housed in twelve departments, including Agronomy; Animal Science; Biochemistry, Biophysics and Molecular Biology; Civil, Construction and Environmental Engineering; Entomology; Food Science and Human Nutrition; Genetics, Developmental and Cell Biology; Geological and Atmospheric Sciences; Plant Pathology and Microbiology; Veterinary Diagnostic and Production Animal Medicine; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology. Faculty coordinate graduate education and research in a wide range of topics fundamental to the discipline of microbiology. Specific information about individual faculty and their research areas is available at [www.micrograd.iastate.edu](http://www.micrograd.iastate.edu). (<http://www.micrograd.iastate.edu/>)

Prerequisites to graduate study include a sound undergraduate background in chemistry, mathematics and biology, including microbiology and genetics.

Graduates in the Microbiology Graduate program have a broad-based knowledge in the fundamentals of microbiology as well as advanced knowledge in specific areas as determined by their areas of research focus. Students completing the thesis have the technical, research, critical-thinking, problem-solving, and computer skills to design, implement, and conduct research using a variety of current techniques and equipment. They are also able to communicate research results effectively with scientific peer groups in both oral and written formats.

## Natural Resource Ecology and Management

The department addresses a broad spectrum of natural resource and environmental issues in a holistic approach to learning, discovery and engagement. Our vision of natural resources is that informed protection and management of natural resources involves an integration of biological, economic, and social considerations. Such an integrated and comprehensive approach to the education of future generations of natural resource managers and scientists is needed in order to sustain viable landscapes, facilitate strong communities, and produce desired goods, services, and functions from our natural resources.

Our educational mission for the undergraduate and graduate programs is to provide those learning experiences and opportunities that will ensure students can learn to function effectively in their chosen fields.

Central to that effective functioning are the abilities to:

- Identify, explain and critically evaluate their own beliefs, values and actions in relation to professional and societal standards of ethics.
- Anticipate, analyze and evaluate natural resource issues and opportunities, explaining the ecological, economic, and social consequences of natural resource actions at various scales and over time.
- Actively seek the input and perspectives of diverse stakeholders regarding natural resource problems and issues.
- Assess, analyze, synthesize, and evaluate information fairly and objectively.
- Work effectively, both individually and with others, on complex, value-laden natural resource problems that require holistic problem solving approaches.
- Formulate and evaluate alternative solutions to complex problems and recommend and defend best alternatives.
- Communicate clearly and effectively with all audiences using appropriate oral, visual, electronic, and written techniques.
- Recognize and interpret resource problems and opportunities across spatial scales from local to global.
- Appreciate cultural diversity and understand the impact of the global distribution of people and wealth on natural resource use and valuation.
- Exercise leadership skills as professionals and engaged citizens.
- Demonstrate creativity and innovation in identifying and pursuing opportunities that produce environmental, social, or economic value.
- Exercise life-long learning skills developed before graduation.

## Undergraduate Study

The Department of Natural Resource Ecology and Management offers work for the Bachelor of Science degree with majors in animal ecology or forestry. The department participates in interdisciplinary programs in biology, environmental studies, international studies, and pest management. By proper selection of free and restricted elective courses, students can obtain a minor or a second major in these programs or other disciplines.

Contact the department for information about minors from the Department of Natural Resource Ecology and Management.

The Department provides numerous scholarships; application information is available in the departmental Student Services Center.

## Graduate Study

The Department of Natural Resource Ecology and Management offers work for the degrees Master of Science and Doctor of Philosophy with majors in fisheries biology, forestry, and wildlife ecology. A non-thesis masters degree is available for students desiring a general degree program without thesis research. Students may also major in interdepartmental graduate majors in ecology and evolutionary biology, environmental science, genetics, plant physiology, sustainable agriculture, or toxicology (see Index (<http://catalog.iastate.edu/azindex/>)). All students are required to teach and conduct research as part of their training for the Ph.D. degree.

## Fisheries Biology and Wildlife Ecology

Graduates have a broad understanding of the basic principles of animal biology, ecology and management, and relevant aspects of basic mathematics and natural sciences, computing applications, and personal and professional development. They are able to execute rigorous independent research, have developed problem-solving and critical-thinking skills, and can communicate effectively with scientific colleagues and the general public in both formal and informal settings.

Personnel of the U.S. Geological Survey's Iowa Cooperative Fish and Wildlife Research Unit contribute significantly to the graduate program of the department through teaching and research. Governmental agencies such as the U.S. Fish and Wildlife Service, Natural Resources Conservation Service and the Iowa Department of Natural Resources, and non-governmental agencies such as The Nature Conservancy and the Iowa Natural Heritage Foundation also contribute to the graduate program by funding research, providing in-kind support, and providing numerous formal and informal mentoring relationships.

No more than two dual-listed animal ecology courses may be applied for major graduate credit. Additional work is expected of students taking a dual-listed course for credit at the 500 level.

## Forestry

The department offers programs leading to the degrees of Master of Science and Doctor of Philosophy with a major in forestry and minor work to students taking major work in other departments.

Graduates are skilled at defining a research problem in forestry, applying scientific principles and appropriate methods, and analyzing the results. They are capable of understanding the many facets of forest and wood science and are very knowledgeable in specific areas in forestry. They are able to deal with complex forestry problems, and where appropriate, they are capable of blending ecological, social, ethical, legal, and economic factors in the research process. They are very skilled at communicating, both in written and oral form, research results to professional and lay audiences. They are sensitive to cultural diversity and work effectively with peers, natural resource professionals, and the public.

The graduate program is open to, and suitable for, students who have majored in forestry or related natural resource fields. A non-thesis master's option is available.

The department participates in the Masters in Business Administration (M.B.A.), with specialization in the agriculture program administered by the College of Business, providing an opportunity to obtain an M.B.A. degree while taking advanced courses in forestry and maintaining contact with the profession of forestry.

### Courses primarily for undergraduates:

#### A ECL 231: Principles of Wildlife & Fisheries Conservation

Cr. 3. S.

*Prereq:* BIOL 211; BIOL 212; NREM 120

Introduction to the principles of wildlife and fisheries management. Case studies will be explored along with assessment methods used to understand management including conservation of populations, species and communities, as well as habitat preservation and restoration.

#### A ECL 312: Ecology

(Cross-listed with BIOL, ENSCI). (3-3) Cr. 4. F.SS.

*Prereq:* BIOL 211; (BIOL 212 or BIOL 251)

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats.

**A ECL 321: Fish Biology**

(2-3) Cr. 3. S.

*Prereq: A ECL 365*

Biology, ecology, and evolution of fishes. Emphasis on structure, physiology, and behavior, including a focus on the conservation and management of fishes and their habitats. Laboratory focus on fish morphology, survey methods, identification, distribution, habits, and habitats of fishes.

**A ECL 333: Fisheries Techniques**

(Cross-listed with NREM). (1-3) Cr. 2. F.

*Prereq: BIOL 212*

Introduction to techniques used in the collection and interpretation of fish population data in the field and in the lab. Course objectives include an understanding of population survey methodology and improving student critical thinking and teamwork skills. Laboratory focuses on field trips and hands-on sampling experience.

**A ECL 365: Vertebrate Biology**

(Cross-listed with BIOL). (3-2) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L*

Evolution, biology, and classification of fish, amphibians, reptiles, birds, and mammals. Emphasis on a comparative analysis of the structure and function of organ systems. Laboratory exercises concentrate on morphology and identification of orders of vertebrates.

**A ECL 366: Natural History of Iowa Vertebrates**

(2-3) Cr. 3. S.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Vertebrate fauna of Iowa, including fishes, amphibians, reptiles, birds, and mammals. Species identification, habitat requirements, community structure and assessment, conservation issues that include historical population changes and value of wild animals to the region's ecological and economic health.

**A ECL 371: Ecological Methods**

(Cross-listed with BIOL). (2-3) Cr. 3. F.

*Prereq: A ECL 312; (STAT 101 or STAT 104)*

Quantitative techniques used in management of natural resources with emphasis on inventory and manipulation of habitat and animal populations.

**A ECL 372: Wildlife Population Methods**

(1-8) Cr. 4. SS.

*Prereq: BIOL 312 or NREM 311*

Field-intensive study of population ecology. Emphasis on hands-on learning of study design and techniques to assess population trends in plants, invertebrates, and vertebrates inhabiting terrestrial and aquatic ecosystems.

**A ECL 375: Marine Ecology and Ecosystems Dynamics**

(Cross-listed with BIOL, ENSCI). (3-0) Cr. 3. S.

*Prereq: BIOL 211*

Overview of the ecological processes, ecosystems, and biodiversity in marine environments. Ever-changing dynamics caused by environmental disturbances, internal forces, or by human impacts on species and ecosystems.

**A ECL 401: Intro to Aquatic Animal Medicine**

(Cross-listed with B M S). (1-2) Cr. 1. S.

8-week course. Introductory course with focus on fin fish production, health and medicine. Course content will help define future roles for veterinarians, producers, and service providers. Emphasis will be placed on water-evaluation, anatomy, pathology, infectious diseases, nutrition, regulatory constraints in production, food safety, biosecurity and current research. Field trip to aquaculture facility.

**A ECL 406: Wildlife Camp**

Cr. 3. F.

*Prereq: BIOL 211; Animal Ecology major; Permission of Instructor*

Introduction to methods and career options in wildlife research and management through field work. Two-week field work experience followed by on-campus reflection, analysis and presentation of field data.

**A ECL 415: Ecology of Freshwater Invertebrates, Plants, and Algae**

(Dual-listed with A ECL 515). (2-3) Cr. 3. F.

*Prereq: A ECL 312*

Identification, biology, and ecological requirements of freshwater invertebrates, plants and algae. Additional emphases on community sampling methods and analysis, and use of organisms as tools for aquatic ecosystem health assessment.

**A ECL 418: Stream Ecology**

(Dual-listed with A ECL 518). (Cross-listed with ENSCI). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A ECL 486*

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**A ECL 425: Aquatic Insects**

(Dual-listed with A ECL 525). (Cross-listed with ENT). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**A ECL 435: Entomology Field Trip**

(Cross-listed with ENT). Cr. 2. Repeatable, maximum of 2 times. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq:* BIO 312; *Permission of Instructor*

Field trip to study insects of major terrestrial and aquatic ecosystems. Location and duration vary. ENT 370 or ENT 425 recommended.

**A ECL 440: Fishery Management**

(Dual-listed with A ECL 540). (2-3) Cr. 3. F.

*Prereq:* A ECL 312; A ECL 321; A ECL 333; (STAT 101 or STAT 104); *credit or concurrent enrollment in A ECL 486*

Biological basis of fishery management, fishery problems, and management practices for freshwater, anadromous, and marine fisheries.

**A ECL 442: Aquaculture**

(Dual-listed with A ECL 542). (3-0) Cr. 3. S.

*Prereq:* BIOL 211; BIOL 212

Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetics, diseases, and marketing.

**A ECL 451: Wildlife Ecology and Management**

(2-3) Cr. 3. S.

*Prereq:* A ECL 371

Ecological theory and practice of wildlife management, including, population ecology, habitat management, and current issues in the field. Course involves a series of case studies addressing actual wildlife issues using field and quantitative methods.

**A ECL 454: Principles of Wildlife Disease**

(Dual-listed with A ECL 554). (3-0) Cr. 3. S.

*Prereq:* *Junior classification; 10 credits in BIOL at the 300+ level*

Ecological and epidemiological aspects of diseases as they relate to wildlife populations. Topics to be covered include: major classes of disease; detection, description, monitoring, and management of disease; characteristics and interactions between disease agents and wildlife hosts; relationships among wildlife, domestic animal, and human health.

**A ECL 455: International Wildlife Issues**

(3-0) Cr. 3. F.

*Prereq:* A ECL 365; (A ECL 312 or *Graduate standing*); NREM 120

Biological, political, social, and economic factors affecting the management of international wildlife resources.

Meets International Perspectives Requirement.

**A ECL 457: Herpetology**

(Cross-listed with BIOL). (2-0) Cr. 2. F.

*Prereq:* BIOL 351 or BIOL 365

Biology, ecology, and evolution of amphibians (salamanders, frogs, caecilians) and reptiles (lizards, snakes, tuatara, turtles, crocodilians). Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of amphibians and reptiles in ecosystems, and conservation. Laboratory focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**A ECL 457L: Herpetology Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. F.

*Prereq:* BIOL 351 or BIOL 365 or A ECL 365; *Concurrent enrollment in BIOL 457 or A ECL 457*

Laboratory to accompany Biology/Animal Ecology 457. Focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**A ECL 458: Ornithology**

(Cross-listed with BIOL). (2-0) Cr. 2. S.

*Prereq:* A ECL 365 or BIOL 351

Biology, evolution, ecology and taxonomy of birds. Emphasis on structure, physiology, behavior, communication, navigation, reproduction, and conservation.

**A ECL 458L: Ornithology Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. S.

*Prereq:* (A ECL 365 or BIOL 351); *concurrent enrollment in A ECL 458 or BIOL 458*

Laboratory complements lecture topics with emphasis on external anatomy, identification and distribution of Midwest birds, and field trips.

**A ECL 459: Mammalogy**

(Cross-listed with BIOL). (2-0) Cr. 2. S.

*Prereq:* A ECL 365 or BIOL 351

Biology, ecology, and evolution of mammals. Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of mammals in ecosystems, and conservation.

**A ECL 459L: Mammalogy Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. S.

*Prereq:* (A ECL 365 or BIOL 351); *concurrent enrollment in (A ECL 459 or BIOL 459)*

Laboratory focus on identification, survey methods, distribution, habits, and habitats of mammals. Several field trips.

**A ECL 471: Introductory Conservation Biology**

(Cross-listed with BIOL). Cr. 3. S.

*Prereq: BIOL 312*

Examination of conservation issues from a population and community perspective. The role of genetics, demography, and environment in determining population viability, habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**A ECL 480: Studies in Marine Biology**

Cr. 1-8. Repeatable. SS.

Courses taken at Gulf Coast Research Laboratory and other marine biological stations are transferred to Iowa State University under this number.

**A ECL 486: Aquatic Ecology**

(Dual-listed with A ECL 586). (Cross-listed with BIOL, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**A ECL 486L: Aquatic Ecology Laboratory**

(Dual-listed with A ECL 586L). (Cross-listed with BIOL, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**A ECL 489: Population Ecology**

(Dual-listed with A ECL 589). (Cross-listed with BIOL). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**A ECL 515: Ecology of Freshwater Invertebrates, Plants, and Algae**

(Dual-listed with A ECL 415). (2-3) Cr. 3. F.

*Prereq: A ECL 312*

Identification, biology, and ecological requirements of freshwater invertebrates, plants and algae. Additional emphases on community sampling methods and analysis, and use of organisms as tools for aquatic ecosystem health assessment.

**A ECL 516: Avian Ecology**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A ECL 365, A ECL 312, or graduate standing*

Current topics and theories including avian breeding and foraging ecology, population biology, community structure, habitat selection, field methodologies, and data interpretation.

**A ECL 518: Stream Ecology**

(Dual-listed with A ECL 418). (Cross-listed with ENSCI). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A ECL 486*

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**A ECL 520: Fisheries Science**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A ECL 312, A ECL 321*

Concepts, approaches, and techniques for assessment of recreational and commercial fisheries. Scope will range from individual fish to entire ecosystems, both freshwater and marine.

**A ECL 525: Aquatic Insects**

(Dual-listed with A ECL 425). (Cross-listed with ENT). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**A ECL 531: Conservation Biology**

(Cross-listed with EEOB). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 312; BIOL 313 or graduate standing*

Examination of conservation issues from a population and a community perspective. Population-level analysis will focus on the role of genetics, demography, and environment in determining population viability. Community perspectives will focus on topics such as habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**A ECL 540: Fishery Management**

(Dual-listed with A ECL 440). (2-3) Cr. 3. F.

*Prereq: A ECL 312; A ECL 321; A ECL 333; (STAT 101 or STAT 104); credit or concurrent enrollment in A ECL 486*

Biological basis of fishery management, fishery problems, and management practices for freshwater, anadromous, and marine fisheries.



**A ECL 542: Aquaculture**

(Dual-listed with A ECL 442). (3-0) Cr. 3. S.

*Prereq: BIOL 211; BIOL 212*

Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetics, diseases, and marketing.

**A ECL 551: Behavioral Ecology**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: a course in ecology or animal behavior*

The study of how an animal's behavior affects its ability to survive and reproduce in its environment. Course topics, such as foraging behavior, sexual selection, parental care, etc., represent the interface of ecology, evolution, and behavior.

**A ECL 554: Principles of Wildlife Disease**

(Dual-listed with A ECL 454). (3-0) Cr. 3. S.

*Prereq: Junior classification; 10 credits in BIOL at the 300+ level*

Ecological and epidemiological aspects of diseases as they relate to wildlife populations. Topics to be covered include: major classes of disease; detection, description, monitoring, and management of disease; characteristics and interactions between disease agents and wildlife hosts; relationships among wildlife, domestic animal, and human health.

**A ECL 586: Aquatic Ecology**

(Dual-listed with A ECL 486). (Cross-listed with EEOB, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**A ECL 586L: Aquatic Ecology Laboratory**

(Dual-listed with A ECL 486L). (Cross-listed with EEOB, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**A ECL 589: Population Ecology**

(Dual-listed with A ECL 489). (Cross-listed with EEOB). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**A ECL 599: Creative Component**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

**Courses for graduate students:****A ECL 611: Analysis of Populations**

(2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312; STAT 401; a course in calculus*

Quantitative techniques for analyzing vertebrate population data to estimate parameters such as density and survival. Emphasis on statistical inference and computing.

**A ECL 698: Animal Ecology Teaching Practicum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification in animal ecology and permission of instructor*

Graduate student experience in the animal ecology teaching program.

Offered on a satisfactory-fail basis only.

**A ECL 699: Research**

Cr. arr. Repeatable.

**Courses primarily for undergraduates:****FOR 201: Forest Biology**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 202; FOR 203; FOR 204; FOR 205; FOR 206*

Discussion of ecological concepts, individual tree structure and growth, variation and diversity in tree populations. Physical environment of trees and forests, ecological processes in forest communities, and introduction to different regional forest communities.

**FOR 202: Sustainable Materials: Wood Utilization**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 203; FOR 204; FOR 205; FOR 206*

Basis for use of wood as an industrial raw material for lumber, composites, pulp and paper, energy and chemicals. Implications of use of alternative renewable and non-renewable materials for societal infrastructure and consumer goods.

**FOR 203: Resource Measurements/Evaluation**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in (FOR 201; FOR 202; FOR 204; FOR 205; FOR 206); MATH 140*

Survey techniques involved in quantification, valuation, and evaluation of tree and stand growth and other variables in the forest environment (e.g., recreational use, wildlife habitat value, biomass, and solid wood).

**FOR 204: Forest Ecosystem Decision-Making**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 205; FOR 206*

Methods of decision-making related to forest ecosystems including communications, teams and conflict resolution. Current issues relating to public, private, and urban forests; quantification of processes, services, and goods produced by the forest and expected by the public such as wildlife, water, range, recreation, wilderness, biodiversity, as well as wood and fiber products.

**FOR 205: Integrated Forestry Laboratory**

(0-8) Cr. 3. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 204; FOR 206*

Field and laboratory exercises integrating the evaluation and management of forest goods, services, and the processing of wood products.

**FOR 206: Fall Forestry Camp**

Cr. 4. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 204; FOR 205*

Three-week field camp to address topics and issues covered in 201, 202, 203, 204, and 205.

**FOR 280: Wood Properties and Identification**

(3-3) Cr. 4. S.

Properties of wood and how they relate to its successful use. Comparative anatomical characteristics, scientific nomenclature, and hand lens identification of commercially important North American woods.

**FOR 283: Pesticide Application Certification**

(Cross-listed with AGRON, ENT, HORT). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**FOR 290: Special Problems**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290A: Special Problems: Leadership in Forestry Teams (LIFT)****Learning Community**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290B: Special Problems: Forest Ecosystem Management**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290C: Special Problems: Natural Resource Conservation**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290D: Special Problems: Urban and Community Forestry**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290E: Special Problems: Wood Science and Technology**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 302: Silviculture**

(3-3) Cr. 4. S.

*Prereq: A ECL 312 or FOR 201 or NREM 301*

Manipulation of forest vegetation based on ecological principles for the production of goods and services.

**FOR 356: Dendrology**

(Cross-listed with BIOL). (2-2) Cr. 3. F.

*Prereq: BIOL 211*

Identification and ecology of North American woody plant species. Importance of woody plants in timber production and wildlife habitat. Historical conditions of North American forest regions will also be addressed.

**FOR 358: Forest Herbaceous Layer: Ecology and Identification.**

(0.5-1) Cr. 1. S.

*Prereq: BIOL 211*

Survey of the major plant families, general, and representative species of the forest herbaceous layer. Functional ecology and restoration.

**FOR 416: Forest Insects and Diseases**

(Cross-listed with PL P). (2-2) Cr. 3. F.

*Prereq: BIOL 211; 4 additional credits in life sciences*

Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests. Laboratory experience working with insect and fungal pests of trees.

**FOR 442: Dynamics of Forest Stands**

(Dual-listed with FOR 542). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FOR 302; NREM 301; (STAT 101 or STAT 104)*

Change in forest species composition and structure at the stand and landscape scales resulting from site quality, tree growth, competition, succession, and disturbance. Methods for assessing tree growth and reconstructing past stand development. Applications to forest and savanna management.

**FOR 451: Forest Resource Economics and Quantitative Methods**

(3-3) Cr. 4. S.

*Prereq: FOR 203*

Application of economic principles to forest resource management considering both market and non-market goods and services. Methods of identifying and specifying problems in the management and use of forest resources. Application of mathematical and statistical models to the solution of managerial problems.

**FOR 452: Ecosystem Management**

(Dual-listed with FOR 552). (Cross-listed with NREM). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**FOR 454: Forestry Practicum**

(1-4) Cr. 3. S.

*Prereq: Senior classification or Permission of Instructor*

Integrated decision-making related to the conservation, management, and preservation of private and public forests, wildlands, urban/community forests, and/or the production and utilization of wood products. Student teams work with a client and develop management plans that incorporate ecological, social, economic, ethical, and institutional/political factors. Effective teamwork, written/oral/visual communication, and problem-solving stressed. Multiple trips to project site and client.

**FOR 475: Urban Forestry**

(Cross-listed with HORT). (2-3) Cr. 3. F.

*Prereq: Junior or Senior classification; 3 credits in BIOL*

Discussion of establishment and management of woody perennials in community-owned urban greenspaces, consideration of urban site and soil characteristics, plant physiology, plant culture, urban forest valuation, inventory methods, species selection, and urban forest maintenance (health care and pest management).

**Courses primarily for graduate students, open to qualified undergraduates:**

**FOR 542: Dynamics of Forest Stands**

(Dual-listed with FOR 442). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FOR 302; NREM 301; (STAT 101 or STAT 104)*

Change in forest species composition and structure at the stand and landscape scales resulting from site quality, tree growth, competition, succession, and disturbance. Methods for assessing tree growth and reconstructing past stand development. Applications to forest and savanna management.

**FOR 552: Ecosystem Management**

(Dual-listed with FOR 452). (Cross-listed with NREM). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**FOR 599: Creative Component**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599A: Creative Component: Forest Biology**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599B: Creative Component: Forest Biometry**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599C: Creative Component: Forest and Recreation Economics**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599D: Creative Component: Forest Management and Administration**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599E: Creative Component: Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**Courses for graduate students:****FOR 696: Research Seminar**

(Cross-listed with AGRON, BBMB, GDCB, HORT, PLBIO). Cr. 1. Repeatable. Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**FOR 699: Research**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699A: Research: Forest Biology - Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699B: Research: Forest Biometry**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699C: Research: Forest Economics**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699D: Research: Forest Management and Administration**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699E: Research: Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699F: Research: Plant Physiology**

Cr. 1-12. Repeatable, maximum of 12 credits.

**Courses primarily for undergraduates:****NREM 104: Practical Work Experience**

Cr. R.

Three months of relevant work experience in natural resources, animal ecology, or forestry. Study at a summer biological station may be applicable. See advisor for specific requirements and approval process.

**NREM 110: Orientation in Natural Resource Ecology and Management**

Cr. 1. F.

Orientation to the University and to the Department of Natural Resource Ecology and Management. Discussion of departmental learning outcomes, strategies for academic success and academic planning. Offered on a satisfactory-fail basis only.

**NREM 111: NREM Transitions Learning Community Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Enrollment limited to members of the NREM Transitions Learning Community. Designed to assist new transfer students and continuing sophomore students with their transition to the academic expectations and professional development aspects of the natural resource program. Offered on a satisfactory-fail basis only.

**NREM 115: Explorations in Natural Resource Ecology & Management**

Cr. 1. S.

*Prereq: (Animal Ecology or Forestry major); Permission of Instructor*

Interact with faculty in the Department of Natural Resource Ecology and Management through lectures, discussions, and field experiences. Offered during the second half of Spring semester.

**NREM 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**NREM 130: Natural Resources and Agriculture**

(Cross-listed with ENV S). (3-0) Cr. 3. S.

Survey of the ecology and management of fish, forest, and wildlife resources in areas of intensive agriculture, with emphasis on Iowa. Conservation and management practices for private agricultural lands. Designed for nonmajors.

**NREM 207: Natural Resource Management under the North American Model of Conservation**

(1-0) Cr. 1. F.

Introduction to North American model of conservation, current funding for natural resource management, role of hunting and angling in the North American model, critique and refinement of the model for the 21st century, and introduction to natural resource leadership, and outdoor skills and recreation. Offered on a satisfactory-fail basis only.

**NREM 211: Careers in Natural Resources**

Cr. 1. F.S.

*Prereq: Sophomore classification*

Career planning exploration in natural resources. Discussion of the job application process, including techniques for successful interviewing and development of an effective resume. Offered on a satisfactory-fail basis only.

**NREM 240: Quantitative Problem Solving in Natural Resources**

Cr. 3. S.

*Prereq: (STAT 101 or STAT 104) or Permission of Instructor*

Applied quantitative problem-solving skills for natural resource management. Focus on group and individual exercises, with practical problems in geography, hydrology, forestry and ecology. Laboratory includes field data collection and computer data processing and modeling.

**NREM 250: Environmental Geography**

(Cross-listed with AGRON, ENSCI, ENV S). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

**NREM 270: Foundations in Natural Resource Policy and History**

(Cross-listed with ENV S, L A). (3-0) Cr. 3. F.

The development of natural resource conservation philosophy and policy from the Colonial Era to the present. North American wildlife, forestry, and environmental policy; national parks and other protected lands; federal and state agencies. Relationship to cultural contexts, including urban reform and American planning movement. Discussion of common pool resources, public and private lands.

**NREM 301: Natural Resource Ecology and Soils**

(Cross-listed with ENSCI). (3-3) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L; (FOR 201 or a second course in biology)*

Effects of environmental factors on ecosystem structure and function using forest, prairie and agricultural ecosystems as models. Special emphasis is given to soil-forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics. Additional emphasis is given to human influences on natural ecosystems and the role of perennial plant communities in agricultural landscapes.

**NREM 303: Internship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor; Sophomore classification*

Placement with county conservation boards, camps, zoos, parks, etc., for experience as interpreters, rangers, and technicians.

**NREM 305: Seminar**

(2-0) Cr. 1-3. Repeatable. F.S.

Current topics in natural resources or related issues.

**NREM 311: Field Ecology in Montana**

Cr. 4. SS.

*Prereq: (BIOL 211; BIOL 211L; BIOL 212; BIOL 212L); Permission of Instructor*

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Taught at NREM's Rod and Connie French Conservation Education Camp in western Montana. Emphasizes hands-on learning of principles and methods in the field.

**NREM 313: Native Land, Water, and Resources**

(Cross-listed with AM IN). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Examines Native land rights, water rights, and natural resources.

Topics may include Native relations to landscapes, cultural resources and infrastructure projects, land rights, water usage agreements, and resource policies as they apply to on- and off-reservation Native communities. AM IN 210 recommended.

**NREM 315: Genetics for Natural Resource Managers.**

(3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 212*

Introduction into how genetic techniques and technologies can aid the management of the earth's biotic resources. Topics include an overview of DNA structure, function and inheritance; tools and techniques for measuring genetic diversity; genetic management of wild and captive populations: DNA forensics as management tool. The goal of this course is to prepare managers/biologists to interpret genetic data as they relate to natural resource conservation.

**NREM 318: Introduction to Ecosystems**

(Cross-listed with AGRON, BIOL, ENSCI). (3-0) Cr. 3. S.

*Prereq: 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**NREM 330: Principles of Interpretation**

(2-3) Cr. 3. S.

*Prereq: 6 credits in BIOL*

History, objectives, forms, and techniques of interpretation in the settings of county, state, national parks, and zoos. Principles of effective communication as they apply to natural resource fields including wildlife management, forestry, and wildlife rehabilitation. Planning and use of effective communications and outreach campaigns to manage and conserve natural resources.

**NREM 333: Fisheries Techniques**

(Cross-listed with A ECL). (1-3) Cr. 2. F.

*Prereq: BIOL 212*

Introduction to techniques used in the collection and interpretation of fish population data in the field and in the lab. Course objectives include an understanding of population survey methodology and improving student critical thinking and teamwork skills. Laboratory focuses on field trips and hands-on sampling experience.

**NREM 345: Natural Resource Photogrammetry and Geographic Information Systems**

(Cross-listed with ENSCI). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Measurement and interpretation of aerial photos in resource management. Introduction to Geographic Information Systems (GIS) using ArcGIS including digitizing, development and query of attribute tables, georeferencing, and use of multiple GIS layers in simple spatial analyses.

**NREM 357: Midwestern Prairie Plants**

(1-2) Cr. 1. F.

Offered 1st half semester only. Survey of the major plant families, genera, and representative species of Midwestern prairies with emphasis on plant identification. Prairie management for multiple species of plants and wildlife.

**NREM 380: Field Ecology Research and Teaching**

Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (A ECL 312 or BIOL 312 or ENSCI 312 or NREM 301) or Department Permission*

Students work in teams to conduct ecological research projects at a local field site, and develop related teaching modules/lesson plans. Research and teaching activity objectives, methods, and results are shared with diverse audiences as presentations, written reports, and web-based documents, and used to engage K-12 students and community members via field days and visits to schools and other institutions.



**NREM 385: Natural Resource Policy**

(Dual-listed with NREM 585). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 390: Fire Ecology and Management**

(3-0) Cr. 3. F.

Characteristics and role of fire in forest ecosystems. Major topics covered include fuels, fire weather, fire behavior, fire danger rating systems, fire control, prescribed burning, and fire dynamics in major ecosystem types.

**NREM 402: Watershed Hydrology**

(Dual-listed with NREM 502). (Cross-listed with ENSCI, GEOL, MTEOR).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 407: Watershed Management**

(Dual-listed with NREM 507). (Cross-listed with NREM). (3-3) Cr. 4. S.

*Prereq:* 1 course in BIOL

Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

**NREM 446: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 546). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq:* 12 credits in student's major at 300 level or above

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 452: Ecosystem Management**

(Dual-listed with NREM 552). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq:* Junior or Senior classification; (NREM 120 or BIOL 173)

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 455: Stream restoration**

(Dual-listed with NREM 555). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq:* A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 455L: Stream Restoration Lab**

(Dual-listed with NREM 555L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq:* A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 460: Controversies in Natural Resource Management**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

*Prereq:* (A ECL 312 or NREM 301); NREM 120; Junior classification

Analysis of controversial natural resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding. Ecological, social, political, economic, and ethical implications of issues will be analyzed.

**NREM 466: Ecosystem Services**

(Dual-listed with NREM 566). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 471: Agroforestry Systems**

(Dual-listed with NREM 571). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* 6 credits in BIOL at 300 level or above

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.



**NREM 483: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 583). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq:* Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 485: Undergraduate Seminar**

Cr. 1. Repeatable, maximum of 2 times. F.S.

*Prereq:* Major in Animal Ecology or Forestry; Junior or Senior classification; Permission of Instructor

Weekly seminars on current research topics in natural resource ecology and management. Style and best practice in oral research communication. Skills and principles for evaluating research merit and quality of technical communication. Offered on a satisfactory-fail basis only.

**NREM 489: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 589). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 589L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq:* 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**NREM 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490A: Independent Study: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490B: Independent Study: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490E: Independent Study: Entrepreneurship**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 490H: Independent Study: Honors Program**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq:* Junior or Senior classification; Permission of Instructor

**NREM 496: Travel Course**

(Dual-listed with NREM 596). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 496A: Travel Course: International**

(Dual-listed with NREM 596A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.

**NREM 496B: Travel Course: Domestic**

(Dual-listed with NREM 596B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq:* Permission of Instructor

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 498: Cooperative Education**

Cr. 1-3. F.S.SS.

*Prereq:* Department Chair Permission

Required of all cooperative education students. Students must register prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**NREM 502: Watershed Hydrology**

(Dual-listed with NREM 402). (Cross-listed with ENSCI, GEOL, MTEOR). (2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 504: Forest Landscapes, Wildlife, and Silviculture**

(2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Permission of instructor*

Desired forest habitat conditions for fish and wildlife. Silvicultural approaches to protecting/improving such habitats. Focus on key forest elements related to animal species, groups and overall diversity. The lab focuses on team observations and discussions of diverse habitats including one weekend field trip.

**NREM 505: Seminar**

(2-0) Cr. 1-3. Repeatable, maximum of 3 times. F.S.

*Prereq: Permission of instructor or graduate classification*

Current topics in natural resources research and management.

**NREM 533: Erosion and Sediment Transport**

(Cross-listed with A B E, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372 or GEOL/ENSCI/MTEOR 402, MATH 166 or equivalent*

Soil erosion processes, soil loss equations and their application to conservation planning, sediment properties, initiation of sediment motion and over land flow, flow in alluvial channels and theory of sediment transport, channel stability, reservoir sedimentation, wind erosion, BMPs for controlling erosion.

**NREM 535: Restoration Ecology**

(Cross-listed with EEOB, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 366 or BIOL 474 or graduate standing*

Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

**NREM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**NREM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**NREM 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**NREM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**NREM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**NREM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**NREM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**NREM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**NREM 546: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 446). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 552: Ecosystem Management**

(Dual-listed with NREM 452). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 555: Stream restoration**

(Dual-listed with NREM 455). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 555L: Stream Restoration Lab**

(Dual-listed with NREM 455L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 566: Ecosystem Services**

(Dual-listed with NREM 466). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 570: Advanced Decision-making in Natural Resource Allocation**

(2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FOR 451 or two courses in economics*

Analytical approach to economic aspects of forest resource management problems. Theory and application of economic decision-making criteria to traditional and modern forest resource management issues. Current problems in the allocation of forest resources.

**NREM 571: Agroforestry Systems**

(Dual-listed with NREM 471). (Cross-listed with SUSAG). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**NREM 583: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 483). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 585: Natural Resource Policy**

(Dual-listed with NREM 385). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 589: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 489). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 489L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**NREM 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590A: Special Topics: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590B: Special Topics: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 593: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification*

**NREM 596: Travel Course**

(Dual-listed with NREM 496). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 596A: Travel Course: International**

(Dual-listed with NREM 496A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.

**NREM 596B: Travel Course: Domestic**

(Dual-listed with NREM 496B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 598: Natural Resource Ecology and Management Teaching****Practicum**

Cr. 1. F.S.SS.

*Prereq: Graduate classification as M.S. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present at least one unit of subject matter in a course or extension workshop. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 599: Creative Component**

Cr. arr.

**Courses for graduate students:****NREM 600: Seminar**

Cr. 1. Repeatable. F.S.

Current topics in natural resources research and management.

**NREM 698: Natural Resource Ecology and Management Teaching Practicum**

Cr. 1. F.S.

*Prereq: Graduate classification as a Ph.D. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present substantive subject matter for a minimum of three weeks in lecture and/or laboratory formats, or a series of extension seminars/workshops. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 699: Research**

Cr. 1-12. Repeatable, maximum of 12 credits.

## Nursing

### OVERVIEW

The Bachelor of Science in Nursing (BSN) program at Iowa State University is a RN-to-BSN program, designed for those who are already a Registered Nurse (RN), and desire to further their nursing career and education to the next level. Iowa State's RN-to-BSN program provides interactive learning opportunities where students can apply their real-world experiences and education to inspire innovation in their places of care. RN-to-BSN students will be challenged to enhance health promotion and disease prevention, apply nursing science and evidenced-based patient-centered care, focus on the culture of health for nurses, individuals, and communities, and demonstrate the continuum of care, from a nurse's self-care to patient care to community and population health.

Students in the Bachelor of Science in Nursing program who wish to add an additional major, must pursue multiple degrees. Likewise, students in other programs who wish to add a Bachelor of Science in Nursing must pursue multiple degrees.

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is approved by the:

**Iowa Board of Nursing (IBON)**

Riverpoint Business Park  
400 SW 8th St., Suite B  
Des Moines, IA 50309  
(515) 281-3255

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is accredited by the:

**Accreditation Commission for Education in Nursing (ACEN)**

3390 Peachtree Road NE, Suite 1400  
 Atlanta, GA 30326  
 (404) 975-5000

The most recent accreditation decision made by the ACEN Board of Commissioners for the baccalaureate nursing program is initial accreditation.

View the public information disclosed by the ACEN regarding this program at <http://www.acenursing.com/accreditedprograms/programSearch.htm>

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Synthesize theory and concepts from the arts and humanities, natural and social sciences, and nursing in the holistic practice of professional nursing.
2. Integrate knowledge of historical and contemporary nursing with leadership skills and principles to facilitate optimal patient and systems outcomes.
3. Translate research findings to support evidence-based, competent, safe, and effective nursing care to individuals, families, and communities in diverse settings across the lifespan.
4. Utilize current technology effectively and efficiently to communicate, manage knowledge, mitigate error, support decision making and accomplish goals related to the delivery of safe, quality care for diverse individuals, families, and the community.
5. Examine how healthcare policies, including financial and regulatory, influence healthcare systems, nursing practices and population health.
6. Incorporate principles of effective communication and collaboration when working with members of the health team, recipients of care and interested groups to improve health outcomes for individuals, groups and communities.
7. Integrate concepts of health promotion and disease management, health literacy and patient-centered care to improve population health.
8. Engage in professional, culturally competent, and ethically congruent care that reflects dignity and uniqueness of individuals and groups in diverse populations and locations.
9. Demonstrate a commitment to professionalism and model the values of advocacy, compassion, integrity, human dignity, cultural competence and social justice while embracing the concept of continuous learning.

## RN-to-BSN Admissions Criteria

Applications for the RN-to-BSN program are individually reviewed. Minimum requirements for admission to the BSN program include:

- Licensure as a Registered Nurse
- Meet all Iowa State University admission criteria for transfer students
- Official college transcripts from all colleges and universities attended
- Minimum of 2.5 cumulative GPA for all college coursework
- Achievement of minimum "C" (not C-) for all prerequisite courses listed below

English Composition I and II (ENGL 150 and ENGL 250 equivalent)

Introduction to Chemistry (CHEM 163 or CHEM 1T equivalent)

Statistics (STAT 101 or STAT 104 equivalent)

Introduction to Human Nutrition (FS HN 167 equivalent)

Introduction to Sociology (SOC 134 equivalent)

Admissions requirements are congruent with the Iowa Action Coalition, RN-to-BSN Task Force Recommendations.

## RN-to-BSN Progression Criteria

- Must earn a "C" grade or better in all NRS courses and meet the university's academic standards for progress toward a degree

## RN-to-BSN Graduation Requirements

- At least 32 credits earned in residence at Iowa State University, and the final 32 credits taken through Iowa State University prior to graduation.
- All general education requirements at Iowa State University must be met.
- The BSN curriculum consists of 21 credits of NRS courses, 8 credits of FS HN courses, and 3 elective credits for a total of 32 credits in addition to prerequisite coursework.
- Electives are selected by students to meet identified career interests, and total elective credits needed will vary based on individual transfer credits.
- Minimum credits for graduation is 120 credits.

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

**Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
Oral Communication course, select from:		3
COMST 214 Professional Communication		
SP CM 212 Fundamentals of Public Speaking		

**Humanities and Social Sciences: 3 cr.**

SOC 134	Introduction to Sociology	3
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**College of Human Sciences Students Only:  
Additional Humanities and Social Sciences: 9 cr.**

Humanities courses from approved list <sup>1</sup>	6
Humanities or social science course	3

**College of Agriculture & Life Science Students Only:  
Additional Humanities and Social Sciences: 6 cr.**

Humanities course from approved list <sup>1</sup>	3
Ethics course from approved list <sup>2</sup>	3

<sup>1</sup> Approved Humanities course list (<https://www.cals.iastate.edu/student-services/humanities/>)

<sup>2</sup> Approved Ethics course list (<https://www.cals.iastate.edu/student-services/ethics/>)

**Math, Physical, & Biological Sciences: 7-8 cr.**

Statistics course, select from:	3-4
STAT 101 Principles of Statistics	
STAT 104 Introduction to Statistics	
CHEM 163 College Chemistry	4
<b>Total Credits</b>	<b>7-8</b>

**College of Agriculture & Life Sciences students only:  
Additional Math, Physical & Biological Sciences: 7-8 crs.**

Select math course: MATH 104, MATH 105, MATH 140, MATH 143, MATH 145, MATH 150, MATH 151, MATH 160, or MATH 165	3-4
Select biology course: BIOL 101, BIOL 211, or BIOL 212	3
CHEM 163L Laboratory in College Chemistry	1
<b>Total Credits</b>	<b>7-8</b>

**Nursing Courses: 21 cr.**

NRS 250 Orientation to RN - to - BSN Nursing	1
NRS 320 Essential Concepts for Professional Nursing Practice	3
NRS 340 Nursing Research and Evidence-Based Practice	4
NRS 420 Promoting a Culture of Health and Wellness	3
NRS 440 Population and Community Health Nursing <sup>†</sup>	3
NRS 442 Population and Community Health Nursing Practicum	1
NRS 460 Nursing Leadership and Management	3
NRS 480 Advanced Concepts of Professional Nursing	3
<b>Total Credits</b>	<b>21</b>

<sup>†</sup> May fulfill the U.S. Diversity Requirement - check current list

**Select at least 3.0 credits of elective: 3 cr.  
Nutrition: 8 cr.**

FS HN 364 Nutrition and Prevention of Chronic Disease	3
FS HN 365 Obesity and Health	3

FS HN 430 U.S. Health Systems and Policy	2
<b>Total Credits</b>	<b>8</b>

**Electives: Select from any university coursework to earn at least ≥ 120 total credits prior to graduation.**

**Total credits for Nursing major = 32**

**Full-Time Enrollment Option**

First Year		
Fall	Credits Spring	Credits
NRS 250	1 NRS 440	3
NRS 320	3 NRS 442 <sup>*</sup>	1
NRS 340	4 NRS 460	3
NRS 420	3 NRS 480	3
FS HN 364 <sup>**</sup>	3 FS HN 365 <sup>**</sup>	3
FS HN 430 <sup>**</sup>	2 Elective or U.S. Diversity as needed <sup>**</sup>	3
	<b>16</b>	<b>16</b>

**Total Credits: 32**

**Part-Time Enrollment Option**

First Year		
Fall	Credits Spring	Credits
NRS 250	1 NRS 460	3
NRS 320	3 FS HN 365 <sup>**</sup>	3
NRS 340	4 FS HN 430 <sup>**</sup>	2
	<b>8</b>	<b>8</b>

**Second Year**

Fall	Credits Spring	Credits
NRS 420	3 NRS 440	3
FS HN 364 <sup>**</sup>	3 NRS 442 <sup>*</sup>	1
Elective or U.S. Diversity as needed <sup>**</sup>	3 NRS 480	3
	<b>9</b>	<b>7</b>

**Total Credits: 32**

\* Denotes Practicum Courses.

\*\* Denotes courses that may be taken before starting the nursing program.

Note Plan of study does not include any unmet ISU general education requirements.

## Nutritional Science (AGLS)

Nutritional science looks at the connection between diet and health.

Students learn how diet can play a crucial role in the cause, treatment,



and prevention of many diseases. There are degree program focuses within nutritional science:

- Pre-health and research coursework prepares students for work in research laboratories, graduate study in nutrition or biological sciences, or entrance into health professional programs, such as medical, dental, physician assistant, and pharmacy schools. Students gain a strong science education along with human nutrition expertise.
- Health coach and nutrition and wellness coursework prepares students for work positions in program planning and evaluation for community, public health, non-profit, and corporate wellness programs addressing the growing public interest in nutrition, wellness, and preventative health. Students learn about the role of nutrition and healthy eating for disease prevention and wellness.

The department also offers a nutrition minor.

## Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Nutritional Science major.

## Degree Requirements

Administered by the Department of Food Science and Human Nutrition

- Pre-Health and Research Program Focus
- Health Coach Program Focus
- Nutrition and Wellness Program Focus

### PRE-HEALTH AND RESEARCH PROGRAM FOCUS

**Total Degree Requirement: 120 cr.**

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

**Communications and Library: 13 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
Select from:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>13</b>

**Humanities and Social Sciences: 6-12 cr.**

Select Humanities courses from approved list	3
Select Social Science course from approved list	3
If H Sci student, select:	6
Additional Humanities course	
Additional Humanities or Social Science course	

**Ethics: 3 cr.**

FS HN 342	World Food Issues: Past and Present	3
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**Mathematical Sciences: 6-12 cr.**

Select at least 3 credits from:		3-8
MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
MATH 165 & MATH 166	Calculus I and Calculus II	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	

**Total Credits 6-12**

**Physical Sciences: 13 cr.**

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
CHEM 231	Elementary Organic Chemistry	3
or CHEM 331	Organic Chemistry I	
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
or CHEM 331L	Laboratory in Organic Chemistry I	

**Total Credits 13**

**Biological Sciences: 24-29 cr.**

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
Select at least 3 credits from:		3-4
BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	
or BIOL 335	Principles of Human and Other Animal Physiology	
BIOL 313	Principles of Genetics	3
Select at least 3 credits from:		3-6
BBMB 301	Survey of Biochemistry	
BBMB 316	Principles of Biochemistry	
BBMB 404 & BBMB 405	Biochemistry I and Biochemistry II	
MICRO 201 or MICRO 302	Introduction to Microbiology Biology of Microorganisms	2-3
MICRO 201L or MICRO 302L	Introductory Microbiology Laboratory Microbiology Laboratory	1
<b>Total Credits</b>		<b>24-29</b>

**Food Science and Human Nutrition: 30 cr.**

FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 492	Research Concepts in Human Nutrition	2
Select at least 10 additional credits from:		10
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	
FS HN 214 & FS HN 215	Scientific Study of Food and Advanced Food Preparation Laboratory (or FS HN 115 lab)	
FS HN 242	The US Food System	
FS HN 267X	Clinical Perspectives on Human Nutrition and Health	

FS HN 301	Nutrigenomics: From Basic Science to Translational Impact	
FS HN 364	Nutrition and Prevention of Chronic Disease	
FS HN 365	Obesity and Health	
FS HN 367	Medical Terminology for Health Professionals	
FS HN 430	U.S. Health Systems and Policy	
FS HN 460	Global Nutrition and Health	
FS HN 461	Medical Nutrition and Disease I	
FS HN 463	Community Nutrition and Health	
FS HN 464	Medical Nutrition and Disease II	
FS HN 466	Nutrition Counseling and Education Methods	
FS HN 490C	Independent Study: Nutrition	
FS HN 499	Undergraduate Research	
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	
NUTRS 504	Nutrition and Epigenetic Regulation of Gene Expression	
BIOL 314	Principles of Molecular Cell Biology	
CHEM 332	Organic Chemistry II	
CHEM 332L	Laboratory in Organic Chemistry II	
PHYS 131 & 131L	General Physics I and General Physics I Laboratory	
or PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	
PHYS 132 & 132L	General Physics II and General Physics II Laboratory	
or PHYS 232 & 232L	Introduction to Classical Physics II and Introduction to Classical Physics II Laboratory	
<b>Total Credits</b>		<b>30</b>

**Electives: 2-25 cr. Select from any university coursework to earn at least 120 total credits. Students planning to apply to health professional programs should review entrance requirements and select appropriate courses as electives.**

Concurrent B.S. and M.S. Program: Well-qualified students in Nutritional Science, pre-health and research option, who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both a Bachelor of Science (B.S.) degree in Nutritional Science and a Master of Science (M.S.) degree in Nutritional Sciences. For more information, refer to [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu) (<http://www.fshn.hs.iastate.edu>)

## HEALTH COACH / NUTRITION & WELLNESS PROGRAM FOCUS

### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These

courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

**International Perspectives: 3 cr.****U.S. Diversity: 3 cr.****Communications/Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

**Humanities and Social Sciences: 12-15 cr.**

Select Humanities course from approved list		3
PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3
FS HN 342	World Food Issues: Past and Present (this course can also meet the IP requirement)	3
If H Sci student, select additional Humanities course		3

**Mathematical Sciences: 6-8 cr.**

Select at least 3 credits from:		3-4
MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>6-8</b>

**Physical Sciences: 5 cr.**

CHEM 163	College Chemistry	4
or CHEM 177	General Chemistry I	
CHEM 163L	Laboratory in College Chemistry	1
or CHEM 177L	Laboratory in General Chemistry I	
<b>Total Credits</b>		<b>5</b>

**Biological Sciences: 18-19 cr.**

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1

BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	3-4
or BIOL 335	Principles of Human and Other Animal Physiology	
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1
<b>Total Credits</b>		<b>18-19</b>

**Food Systems: 8 cr.**

FS HN 242	The US Food System	3
FS HN 342	World Food Issues: Past and Present (course shown above)	3
FS HN 442	Issues in Food and Society	2
<b>Total Credits</b>		<b>8</b>

**Food Science and Human Nutrition: 34 cr.**

FS HN 101	Food and the Consumer	3
FS HN 110	Professional and Educational Preparation	1
FS HN 111	Fundamentals of Food Preparation	2
FS HN 115	Food Preparation Laboratory	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	1
FS HN 264	Fundamentals of Nutritional Biochemistry	3
or BBMB 301	Survey of Biochemistry	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 430	U.S. Health Systems and Policy	2
FS HN 445	Strategies for Personal Food Waste Reduction	1
FS HN 463	Community Nutrition and Health	3
COMST 450B	Special Topics in Communication Studies: Health Communication	3
<b>Total Credits</b>		<b>34</b>

**Additional courses for Health Coach Program Focus: 18 credits**

KIN 258	Principles of Physical Fitness and Conditioning	2
KIN 358	Exercise Physiology	3
KIN 458	Principles of Fitness Assessment and Exercise Prescription	4
PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
PSYCH 422	Counseling Theories and Techniques	3

PSYCH 485	Health Psychology	3
<b>Total Credits</b>		<b>18</b>

Select additional electives to reach 120 total semester credits.

## Additional courses for Nutrition & Wellness Program Focus: 18-30 credits of electives

At least 9 credits of electives must be 300-400 level courses. Select from any university coursework to earn at least 120 total credits.

NOTE:

Students are encouraged to pursue a minor, such as:

- Communication studies
- Culinary food science
- Entrepreneurship
- Environmental studies
- Event management
- Exercise science
- Global health
- Health promotion
- Hospitality management
- Human development and family studies
- Leadership studies
- Sustainability

Go to FS HN courses.

## Nutritional Science, B.S. Program Focus: Health Coach<sup>1</sup>, Nutrition & Wellness<sup>2</sup>

### First Year

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 101	3
FS HN 167	3 CHEM 163 or 177	4
MATH 140, 143, 160, or 165	3-4 CHEM 163L or 177L	1
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
ENGL 150	3 Course based on program focus:	3
LIB 160	1 PSYCH 101 or 230 <sup>1</sup> Elective <sup>2</sup>	
<b>15-16</b>		<b>15</b>

### Second Year

Fall	Credits Spring	Credits
MICRO 201	2 FS HN 203	1
MICRO 201L	1 FS HN 242	3

FS HN 264	3 FS HN 265	3
BIOL 255	3 BIOL 256 and 256L, or 335	3-4
BIOL 255L	1 FS HN 111	2
ENGL 250	3 FS HN 115	1
Course based on program focus:	2-3	
KIN 258 <sup>1</sup>		
Elective <sup>2</sup>		

**15-16 13-14**

### Third Year

Fall	Credits Spring	Credits
FS HN 364	3 FS HN 342	3
PSYCH 101 or 230	3 FS HN 361	2
SP CM 212	3 FS HN 365	3
STAT 104 or 101	3-4 COMST 450B	3
Course based on program focus:	3 Humanities (H Sci) or elective (AgLS)	3
KIN 358 <sup>1</sup>	Course based on program focus:	3
Elective <sup>2</sup>	PSYCH 485 <sup>1</sup> 300-400 level elective <sup>2</sup>	

**15-16 17**

### Fourth Year

Fall	Credits Spring	Credits
FS HN 442	2 FS HN 445	1
FS HN 463	3 FS HN 430	2
Humanities	3 Course based on program focus:	3
SOC 134	3 KIN 458 <sup>1</sup>	
Course based on program focus:	3 300-400 level elective <sup>2</sup>	
PSYCH 422 <sup>1</sup>	U.S. Diversity	3
300-400 level elective <sup>2</sup>	Electives (choose electives to total at least 120 credits)	4-6

**14 13-15**

1, 2 Courses for program focus: Health Coach<sup>1</sup>, Nutrition & Wellness<sup>2</sup>

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

## Nutritional Science, B.S.

### Program Focus: Pre-Health & Research

#### First Year

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 167	3
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
ENGL 150	3 MATH 140, 143, 160, or 165	3-4
LIB 160	1	
Humanities	3	
	<b>17</b>	<b>14-15</b>

#### Second Year

Fall	Credits Spring	Credits
CHEM 231 or 331	3 FS HN 265	3
CHEM 231L or 331L	1 BBMB 301 or 316, or BBMB 404 and 405 the next year	3
BIOL 313	3 Social Science	3
STAT 101 or 104	3-4 Humanities (H Sci) or elective	3
ENGL 250	3 Elective*	3
SP CM 212	3	
	<b>16-17</b>	<b>15</b>

#### Third Year

Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256 and 256L, or 335	3-4
BIOL 255L	1 FS HN 361	2
FS HN 360	3 FS HN 362	3
FS HN 342	3 Humanities/Social Sci. (H Sci) or elective (AgLS)*	3
MICRO 201 or 302	2-3 Additional course from approved list**	3
MICRO 201L or 302L	1	
Elective*	3	
	<b>16-17</b>	<b>14-15</b>

#### Fourth Year

Fall	Credits Spring	Credits
FS HN 492	2 FS HN 467	3
Additional course from approved list**	3 ENGL 302, 309, or 314	3
Additional course from approved list**	3 US Diversity (if not already taken) or elective*	3

Additional course from approved list**	1 Elective*	3-4
Elective*	3 Elective*	3
Elective*	3	
	<b>15</b>	<b>15-16</b>

\* Choose elective courses to total equal to or greater than 120 credits.

\*\* Select at least 10 additional credits from: BIOL 314; CHEM 332, CHEM 332L; FS HN 214 with lab (FS HN 115 or FS HN 215); FS HN 203, FS HN 242, FS HN 267X, FS HN 301, FS HN 364, FS HN 365, FS HN 367, FS HN 430, FS HN 460, FS HN 461, FS HN 463, FS HN 464, FS HN 466, FS HN 490C, FS HN 499; NUTRS 501, NUTRS 504; PHYS 131 or PHYS 231/PHYS 231L; PHYS 132 or PHYS 232/PHYS 232L.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on the Nutrition minor can be found here: <http://catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Nutritional Sciences. More information can be found here: <https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=84>.

## Occupational Safety Certificate

### Undergraduate Certificate in Occupational Safety

The undergraduate certificate in Occupational Safety is designed to meet the needs of undergraduate students who are planning a career with management responsibilities (including safety), but are not planning on careers as safety professionals. This Certificate provides them with desired professional development and recognition of their increased professional knowledge and skills in the field of Occupational Safety.

Working professionals who have discovered that their career path has resulted in an increased focus on occupational safety, but do not have formal educational training in safety will also benefit from this structured safety curriculum. This certificate program prepares professionals, regardless of discipline, to effectively meet expected occupational safety responsibilities.

A professional with an Iowa State University Occupational Safety certificate will strengthen a company's ability to protect their workers from injuries and illnesses. This undergraduate certificate provides a way to give formal recognition of focused study in occupational safety that is less comprehensive than what is required for an undergraduate major.

The Department of Agricultural and Biosystems Engineering, with its nationally ranked education programs, is pleased to offer this Occupational Safety Certificate program to undergraduate students, graduate students, and working professionals. This certificate program is available on campus or entirely online via web-based interactions and streaming media.

20 Credits required.

Students complete the following 14 credits of core courses:

TSM 270	Principles of Injury Prevention and Safety	3
TSM 370	Occupational Safety	3
TSM 371	Occupational Safety Management	2
TSM 372	Legal Aspects of Occupational Safety and Health	2
TSM 470	Industrial Hygiene: Physical, Chemical, and Biological Hazards	3
TSM 493D	Workshop in Technology: Occupational Safety	1-4

The remaining six credits will be selected from the following:

TSM 376	Fire Protection and Prevention	3
TSM 471	Safety Laboratory	1
TSM 477	Risk Analysis and Management	3
TSM 393F	Topics in Technology: Agricultural Safety and Health	1-4
H S 105	First Aid and Emergency Care	2
H S 110	Personal and Consumer Health	3
H S 305	Instructor's First Aid and Cardiopulmonary Resuscitation	2
I E 271	Applied Ergonomics and Work Design	3

A minimum of 9 credits applied towards the certificate cannot be used to meet any other departmental, college, or university requirement.

Courses taken for the certificate cannot be taken pass not pass.

A grade of a 2.0 or better is required in each individual course applied towards the certificate.

## Plant Pathology and Microbiology Undergraduate Study

The department participates in the interdepartmental undergraduate Microbiology major. See [www.catalog.iastate.edu/collegeofagricultureandlifesciences/microbiology/](http://www.catalog.iastate.edu/collegeofagricultureandlifesciences/microbiology/) for more information.

## Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with a major in plant pathology, and minor work for students majoring in other departments or programs. A master of science nonthesis option is available. The department also participates in the interdepartmental majors in microbiology; toxicology; genetics; plant biology; molecular, cellular, and developmental biology; ecology and evolutionary biology; and sustainable agriculture.

Students entering graduate programs in the department need a sound background in the physical, biological, and mathematical sciences as well as adequate preparation in English.

Graduates have a broad understanding of the biology and management of plant pathogenic microorganisms and the interactions of pathogens with their host plants. They understand the relationship between plant pathology and allied disciplines and are able to communicate effectively with scientific colleagues and the general public in both formal and informal settings. Graduates are able to address complex plant disease problems facing agricultural and bioscience professionals, taking into account the related ethical, social, legal, and environmental issues. They are skilled in research procedures, communicating research results, and writing concise and persuasive grant proposals.

### Courses primarily for undergraduates:

#### MICRO 101: Microbial World

(3-0) Cr. 3. F.

Introduction to the importance of viruses, bacteria, fungi, archaea and parasites both to humans and to the biosphere. Topics include past and present microbial impact on humans and society, ecology and diversity of microbes, biotechnology and microbial impact on the biosphere.

Recommended: High School Biology.

#### MICRO 110: Professional and Educational Preparation in Microbiology

(1-0) Cr. 1. F.

An introduction to curriculum and research opportunities in microbiology at Iowa State. Topics include: easing the transition to life as a university student, development of specific goals, strengthening interpersonal communication, professional portfolio creation and resume building. Offered on a satisfactory-fail basis only.

#### MICRO 115: Phage Discovery Lab

(0-4) Cr. 2. F.

An exploratory laboratory where students will purify phage from soil, visualize phage using electron microscopy and isolate genomic material for nucleic acid sequencing.



**MICRO 116: Phage Genome Annotation Lab**

(0-4) Cr. 2. S.

An experiential microbiology laboratory where students learn to annotate and submit a complete phage genome. MICRO 115 recommended.

**MICRO 201: Introduction to Microbiology**

(2-0) Cr. 2. F.S.

*Prereq: One BIOL course except BIOL 110, BIOL 111, BIOL 112, BIOL 173, BIOL 201, BIOL 307*

Selected topics in microbiology with emphasis on the relationship of microorganisms to human and animal health, agricultural technology, and the environment. With written petition to the chair of the supervisory committee, students who obtain a grade of B or better may substitute 201 for Micro 302 in advanced courses.

**MICRO 201L: Introductory Microbiology Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for non-microbiology majors. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

**MICRO 265: Predicting the Next Epidemic: Living in a One Health World**

Cr. 2. F.S.

8 week course. "One Health" concept as a relatively new approach to disease control, sustainability, and the consequences of environmental disruption. Interconnectedness of human, animal, and environmental health. Importance of scientists communicating with the general public about One Health topics, such as habitat loss, agricultural practices, and the spread of antibiotic resistant organisms. Recommended: High School Biology or Environmental Science.

**MICRO 302: Biology of Microorganisms**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211; BIOL 212; 3 credits of CHEM*

Basic cell biology, physiology, metabolism, genetics and ecology of microorganisms, with an emphasis on prokaryotes and viruses, as well as the roles of microorganisms in the environment, disease, agriculture, and industry.

**MICRO 302L: Microbiology Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for majors in microbiology, biological sciences and related fields. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

**MICRO 310: Medical Microbiology**

(3-0) Cr. 3. F.

*Prereq: MICRO 302 or (MICRO 201 minimum B grade)*

Study of infection by bacterial and viral pathogenic agents of humans with an overview of immune responses in controlling disease.

**MICRO 310L: Medical Microbiology Laboratory**

(0-3) Cr. 1. F.

*Prereq: (MICRO 201 or MICRO 302); (MICRO 201L or MICRO 302L); MICRO 310*

Microbiological tools and techniques to isolate, identify, and characterize medically significant microorganisms in relation to human diseases. Emphasis on the virulence factors of pathogenic organisms as compared to the normal flora.

**MICRO 320: Molecular and Cellular Bacteriology**

(4-0) Cr. 4. S.

*Prereq: BIOL 313; MICRO 302; CHEM 332*

A systems perspective of bacterial growth, survival, and cellular differentiation by integrating physiological and genetic principles. Emphasis is on prokaryotes although unicellular eukaryotes are also discussed. Topics include the structure, function, and assembly of cell components, molecular and genomic techniques, bioenergetics and metabolism, regulation of gene expression, genetic adaptation, stress tolerance, biofilms, and cell-cell interactions and communications.

**MICRO 353: Introductory Parasitology**

(Cross-listed with BIOL, V PTH). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**MICRO 360: Global Health**

(Cross-listed with GLOBE, V MPM). (3-0) Cr. 3. F.

*Prereq: BIOL 211*

Explores human health across the world with particular emphasis on low- and lower-middle-income countries. Attention is given to the interconnectedness of health determinants, problems, and solutions found in global health, including the role of animals and the environment. Broad in scope, highlighting different cultures and the historical foundations of global health. Topics include colonialism, poverty, emerging diseases, climate change, biodiversity, one health, maternal and child health, HIV, malaria, urbanization, noncommunicable diseases and more. Current events will be a feature of all class meetings. Meets International Perspectives Requirement.

**MICRO 374: Insects and Our Health**

(Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 3 credits in BIOL*

Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease.

Meets International Perspectives Requirement.

**MICRO 374L: Insects and Our Health Laboratory**

(Cross-listed with ENT). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Credit or concurrent enrollment in ENT 374 or MICRO 374*

Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**MICRO 402: Microbial Genetics and Genomics**

(Dual-listed with MICRO 502). (Cross-listed with GEN). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 507). (Cross-listed with FS HN). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**MICRO 408: Virology**

(3-0) Cr. 3. F.

*Prereq: BBMB 301 or BIOL 313*

The molecular virology and epidemiology of human, animal, plant and insect viruses. BIOL 314 recommended.

**MICRO 419: Foodborne Hazards**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**MICRO 420: Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**MICRO 421: Food Microbiology Laboratory**

(Cross-listed with FS HN). (1-5) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**MICRO 428: Principles of Epidemiology and Population Health**

(Cross-listed with V MPM, VDPAM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**MICRO 430: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 530). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 440: Laboratory in Microbial Physiology, Diversity, and Genetics**

(2-6) Cr. 4. F.S.

*Prereq: BIOL 313L; CHEM 332; MICRO 302; MICRO 302L*

Fundamental techniques and theory for studying the cellular mechanisms, genetic processes and diversity of microbial life. Experimental techniques will include isolation and physiological characterization of bacteria that inhabit different environments as well as an emphasis on genetic and molecular techniques to understand antibiotic resistance processes and mechanisms. Also included are techniques for phylogenetic characterization, measuring gene expression, and genetic manipulation of bacteria. Essential components for the effective communication of scientific results are also emphasized.

**MICRO 450: Undergraduate Capstone Colloquium**

(2-0) Cr. 2. S.

*Prereq: SP CM 212; 20 credits in MICRO*

Required of all undergraduate majors in microbiology. Students demonstrate mastery of core courses in microbiology through discussion of current literature in microbiology and immunology, issues in scientific conduct, and bioethics in microbiology. Students present current papers in a journal club format and gain experience in writing and reviewing grant proposals. This course is a capstone course and should be taken within the last two semesters.

**MICRO 451: Survey in Microbiology**

Cr. R. F.

*Prereq: 12 credits in MICRO*

Preparations for graduation. Topics include job search strategies, career information, mock interviews, graduate and professional school application processes and guidelines as well as outcomes assessment activities.

**MICRO 456: Principles of Mycology**

(Cross-listed with BIOL). (2-3) Cr. 3. F.

*Prereq: 10 credits in BIOL or MICRO*

Morphology, diversity, and ecology of fungi; their relation to agriculture, industry, and human health.

**MICRO 475: Immunology**

(Dual-listed with MICRO 575). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**MICRO 475L: Immunology Laboratory**

(2-4) Cr. 2. S.

*Prereq: MICRO 310 or MICRO 475 or MICRO 575*

Techniques in primary culture and tumor cell growth, measures of lymphocyte function, serological techniques and flow cytometry. Half semester course.

**MICRO 477: Bacterial-Plant Interactions**

(Dual-listed with MICRO 577). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 485: Soil and Environmental Microbiology**

(Dual-listed with MICRO 585). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**MICRO 487: Microbial Ecology**

(Dual-listed with MICRO 587). (Cross-listed with BIOL, ENSCI, GEOL). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 490: Independent Study**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490A: Independent Study: Laboratory Research**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490B: Independent Study: Literature Review**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490C: Independent Study: Instructional Assistant**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490G: Independent Study: General**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490H: Independent Study, Honors**

Cr. 1-5. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 495: Internship**

Cr. 1-2. F.S.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Academic Advisor*

Participation in the Cooperative Extension Intern Program or an equivalent work experience. Written report of activities required. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MICRO 502: Microbial Genetics and Genomics**

(Dual-listed with MICRO 402). (Cross-listed with V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 407). (Cross-listed with FS HN). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**MICRO 509: Plant Virology**

(Dual-listed with MICRO 509). (Cross-listed with PL P). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**MICRO 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, FS HN, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**MICRO 525: Intestinal Microbiology**

(Cross-listed with V MPM). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

Overview of commensal microbiota in the health and well-being of vertebrates. Topics include diversity of intestinal structure, microbial diversity/function, innate immune development, community interactions and metabolic diseases associated with alterations of the intestinal microbiome.

**MICRO 530: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 430). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 540: Livestock Immunogenetics**

(Cross-listed with AN S, V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: AN S 561 or MICRO 575 or V MPM 520*

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

**MICRO 551: Microbial Diversity and Phylogeny**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Comparisons among the three kingdoms of life (Bacteria, Archaea, and Eukarya). Topics will include metabolism, adaptation, methods of phylogenetic analysis, and comparative genomics.

**MICRO 552: Bacterial Molecular Genetics and Physiology**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review of genetics and selected physiological topics of model bacteria.

**MICRO 553: Pathogenic Microorganisms**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review and contrast/comparison of common bacterial pathogens of plants and animals and their mechanisms of virulence, including toxins, protein secretion, host invasion and iron acquisition strategies. An overview of eukaryotic cell biology that is relevant to pathogenesis will also be included.

**MICRO 554: Virology**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

Introduction to virus life cycles including entry, gene expression strategies, replication, and mechanisms to modify and overcome host defenses. The roles of specific viruses and sub-viral agents in animal and plant disease will also be included.

**MICRO 555: Fungal Biology**

(1-0) Cr. 1. S.

*Prereq: GEN 313 or GEN 320 or equivalent.*

Ecology, genetics, physiology and diversity of fungi, from yeasts to mushrooms, and their importance in human affairs.

**MICRO 556: Ecology of Microorganisms**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

The study of microorganisms in their natural environments, with a focus on terrestrial and aquatic ecosystems, including eukaryotic hosts; interactions within biofilms and communities, including intercellular communication and symbioses; microbial adaptations to extreme environments; and metagenomic, genomic, molecular and microscopy techniques for the study of microbes in natural systems.

**MICRO 575: Immunology**

(Dual-listed with MICRO 475). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**MICRO 577: Bacterial-Plant Interactions**

(Dual-listed with MICRO 477). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 585: Soil and Environmental Microbiology**

(Dual-listed with MICRO 485). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**MICRO 586: Medical Bacteriology**

(Cross-listed with V MPM). (4-0) Cr. 4. F.

*Prereq: Permission of Instructor*

Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses. Concurrent students need to register for 586L.

**MICRO 587: Microbial Ecology**

(Dual-listed with MICRO 487). (Cross-listed with EEOB, ENSCI, GEOL).

(3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems.

Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

**Courses for graduate students:****MICRO 604: Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Course will expose students to the breadth of subdisciplines within microbiology, offer opportunities for direct interaction between the students and the faculty members within the Interdepartmental Microbiology Graduate Program, and promote interactions among the students within the program. Offered on a satisfactory-fail basis only.

**MICRO 608: Molecular Virology**

(Cross-listed with PL P, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**MICRO 615: Molecular Immunology**

(Cross-listed with BBMB, V MPM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**MICRO 625: Mechanisms of Bacterial Pathogenesis**

(Cross-listed with V MPM). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Credit in BBMB and MICRO*

Review of current concepts in specific areas of microbial pathogenesis including the genetic basis for bacterial disease, genetic regulation and control of virulence factors and their mechanisms of action, and host-pathogen interactions at the cellular and molecular levels. The application of microbial genetics to understanding pathogenesis will be included.

**MICRO 626: Advanced Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**MICRO 627: Rapid Methods in Food Microbiology**

(Cross-listed with FS HN, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**MICRO 690: Current Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690A: Current Topics: Microbiology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690B: Current Topics: Immunology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690C: Current Topics: Infectious Diseases**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.



**MICRO 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.

Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Microbiology major.

**MICRO 698: Seminar in Molecular, Cellular, and Developmental Biology**  
(Cross-listed with BBMB, GDCB, MCDB, V MPM). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**MICRO 699: Research**

Cr. arr. Repeatable.

**Courses primarily for undergraduates:****PL P 408: Principles of Plant Pathology**

(Dual-listed with PL P 508). (2-2) Cr. 3. F.S.

*Prereq: (BIOL 211 or BIOL 212); 4 additional credits in life sciences*

Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

**PL P 416: Forest Insects and Diseases**

(Cross-listed with FOR). (2-2) Cr. 3. F.

*Prereq: BIOL 211; 4 additional credits in life sciences*

Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests. Laboratory experience working with insect and fungal pests of trees.

**PL P 452: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with PL P 552). (Cross-listed with ENT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**PL P 477: Bacterial-Plant Interactions**

(Dual-listed with PL P 577). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**PL P 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 7 credits in BIOL; Junior or Senior classification; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 490A: Independent Study: Plant Pathology**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; 7 credits in BIOL; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; 7 credits in BIOL; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 494: Seed Pathology**

(Dual-listed with PL P 594). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PL P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PL P 494/594 and STB/PL P 592.

**PL P 494L: Seed Pathology Laboratory**

(Dual-listed with PL P 594L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PL P 506: Plant-Pathogen Interactions**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416, BIOL 313*

Introduction to mechanisms of plant-parasite interaction. Genetics and molecular genetics of plant disease resistance and pathogenicity.

**PL P 508: Principles of Plant Pathology**

(Dual-listed with PL P 408). (2-2) Cr. 3. F.S.

*Prereq: (BIOL 211 or BIOL 212); 4 additional credits in life sciences*

Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

**PL P 509: Plant Virology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**PL P 511: Integrated Management of Tropical Crops**

(Cross-listed with ENT, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects. Meets International Perspectives Requirement.

**PL P 512: Lifestyles of plant pathogenic fungi and oomycetes.**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or MICRO 456 or equivalent.*

Exploration of the major groups of plant pathogenic fungi and oomycetes, focusing on the diseases they cause as well as pathogen ecology, diagnosis, crop resistance, and fungicide resistance.

**PL P 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, ENT, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**PL P 543: Ecology and Epidemiology of Plant Diseases**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416*

Nutter. Theory and practice related to the ecology and epidemiology of plant disease epidemics. Interactions among host and pathogen populations as affected by the environment are quantified with respect to time and space. Analysis of ecological and host and pathogen genetic factors that alter the course of plant disease epidemics. Risk assessment theory, disease forecasting, and modeling the impact of biotic plant stresses on yield and quality are also emphasized.

**PL P 552: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with PL P 452). (Cross-listed with ENT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**PL P 574: Plant Nematology**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent*

Morphology, anatomy, identification, management, and life cycles of common plant-parasitic nematodes; host parasite interactions; recent advances in plant nematology.

**PL P 574L: Laboratory Techniques in Plant Nematology**

(0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent.*

*Must also be registered for PL P 574.*

Practical skills of sample collection, processing, extraction, and identification of plant-parasitic nematodes from soil and roots; other techniques will be discussed.

**PL P 577: Bacterial-Plant Interactions**

(Dual-listed with PL P 477). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**PL P 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with AGRON, ENT, HORT). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**PL P 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 10 credits in biological sciences, permission of instructor*

**PL P 592: Seed Health Management**

(Cross-listed with STB). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Occurrence and management of diseases during seed production, harvest, conditioning, storage, and planting. Emphasis on epidemiology, disease management in the field, seed treatment, effects of conditioning on seed health, and seed health testing. Credit may not be obtained for both PI P/STB 592 and PI P 594.

**PL P 594: Seed Pathology**

(Dual-listed with PL P 494). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PI P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PI P 494/594 and STB/PI P 592.

**PL P 594L: Seed Pathology Laboratory**

(Dual-listed with PL P 494L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**PL P 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: For non-thesis Master of Science students.*

Independent study related to the student's area of specialization and approved by the student's major professor.

**Courses for graduate students:****PL P 608: Molecular Virology**

(Cross-listed with MICRO, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**PL P 628: Improving Professional Presentation Skills**

(2-0) Cr. 2. S.

*Prereq: Graduate student status.*

Skill building to improve oral presentation fundamentals for graduate students in biological sciences. Principles and guidance in both personal speaking style and maximizing impact of presentation software. In-depth lectures and class discussions on all aspects of presentation skills. Video and anonymous peer review of individual speeches.

**PL P 691: Field Plant Pathology**

(0-6) Cr. 2. Repeatable. Alt. SS., offered even-numbered years.

*Prereq: PL P 408 or PL P 416*

Diagnosis of plant diseases, plant disease assessment methods, and the integration of disease management into commercial crop production practices. Objectives are to familiarize students with common diseases of Midwest crops and landscape plants, and to provide experience in disease diagnosis. Field trips include commercial operations, agricultural research facilities, and ornamental plantings.

**PL P 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.

**PL P 694: Colloquium in Plant Pathology**

(2-0) Cr. 2. Repeatable. S.

*Prereq: PL P 408 or PL P 416, permission of instructor*

Advanced topics in plant pathology, including biological control, cultural control, resistance gene deployment, genetic engineering for disease resistance, chemical control, integrated pest management, emerging diseases, fungal genetics, insect vector biology, professional communications, etc.

**PL P 698: Seminar**

Cr. 1. Repeatable. F.S.

**PL P 699: Thesis and Dissertation Research**

Cr. arr. Repeatable.

F.S.SS.

## Sustainable Agriculture

### Interdepartmental Graduate Major

The Sustainable Agriculture interdepartmental major is offered through faculty in 21 departments – Agricultural and Biosystems Engineering; Agricultural Education and Studies; Agronomy; Animal Science; Civil, Construction and Environmental Engineering; Community and Regional Planning; Ecology, Evolution and Organismal Biology; Economics; Entomology; Food Science and Human Nutrition; Horticulture; Industrial and Manufacturing Systems Engineering; Journalism and Mass Communication; Landscape Architecture; Mechanical Engineering; Natural Resource Ecology and Management; Plant Pathology; Political Science; Sociology; World Languages and Cultures and Veterinary Diagnostic and Production Animal Medicine. Faculty in these departments cooperate to offer courses and direct research leading to M.S. and Ph.D. degrees with a major in Sustainable Agriculture.

The Sustainable Agriculture major is designed to balance depth in disciplinary knowledge and perspectives with broader, systems-level thinking. It integrates technical and social sciences through a sequence of team-taught interdisciplinary core courses emphasizing higher-order critical thinking skills and active, collaborative approaches to learning. Students learn agroecological principles, study social relations underlying sustainable farming and food systems, and gain experience with practical techniques of sustainable agriculture.

Applicants applying to the M.S. program must have a bachelor's degree in one of the life, social, or engineering sciences, or a bachelor's degree plus equivalent experience in these areas. Applicants applying to the Ph.D. program must have a master's degree and either an undergraduate or master's degree in one of the majors in the College of Agriculture and Life Sciences or its equivalent.

Graduates of the program will be able to design and manage agricultural systems that increase food security, enhance human communities, and protect environmental quality. Graduates of the program are qualified to work in a variety of settings, including university research, education, extension, agribusiness, governmental and non-governmental organizations, and farming.

Information on application procedures (<https://susag.iastate.edu/admissions/>), curriculum requirements (<https://susag.iastate.edu/academics/>), and faculty research areas (<https://www.susag.iastate.edu/people/faculty/>) is available on the Sustainable Agriculture website (<https://susag.iastate.edu/>).

**Courses primarily for graduate students, open to qualified undergraduates:**

**SUSAG 509: Agroecosystems Analysis**

(Cross-listed with AGRON, SOC). (3-4) Cr. 4. F.

*Prereq: Senior or above classification; permission of instructor*

Experiential, interdisciplinary examination of Midwestern agricultural and food systems, emphasizing both field visits and classroom activities. Focus on understanding multiple elements, perspectives (agronomic, economic, ecological, social, etc.), and scales of operation.

**SUSAG 515: Integrated Crop and Livestock Production Systems**

(Cross-listed with A B E, AGRON, AN S). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SUSAG 509*

Methods to maintain productivity and minimize the negative ecological effects of agricultural systems by understanding nutrient cycles, managing manure and crop residue, and utilizing multispecies interactions. Crop and livestock production within landscapes and watersheds is also considered. Course includes a significant field component, with student teams analyzing Iowa farms.

**SUSAG 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, ENT, PL P). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**SUSAG 544: Sociology of Food and Agricultural Systems**

(Cross-listed with SOC). (3-0) Cr. 3.

*Prereq: SOC 325 or graduate standing*

Social organization of food and fiber production, processing, and distribution systems. Sociological comparison of conventional and alternative production systems; gender roles in agriculture and food systems; local, national and global food systems; perspectives on food and agricultural research and policy.

**SUSAG 546: Strategies for Diversified Food and Farming Systems**

(Cross-listed with AGRON, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: SUSAG 509*

Project-focused engagement in food and farming systems using tools and perspectives drawn from multiple disciplines. Includes a field component.

**SUSAG 549: Sociology of the Environment**

(Cross-listed with SOC). (3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Social causes and social consequences of environmental problems.  
Interrelationship between social inequality and environmental inequality.  
Social construction and social experience of the environment.  
Contemporary developments in the social theory of the environment.  
International and domestic implications.

**SUSAG 571: Agroforestry Systems**

(Cross-listed with NREM). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.  
Meets International Perspectives Requirement.

**SUSAG 584: Organic Agricultural Theory and Practice**

(Cross-listed with AGRON, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in biological or physical sciences*

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture.  
Interdisciplinary examination of crop and livestock production and socioeconomic processes and policies in organic agriculture from researcher and producer perspectives.

**SUSAG 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification, permission of instructor*

For students wishing to conduct in-depth study of a particular topic in sustainable agriculture.

**SUSAG 599: Creative Component**

Cr. arr. F.S.SS.

Pre-enrollment contract required. For MS students pursuing the non-thesis degree option. Final product is a creative component.

**Courses for graduate students:**

**SUSAG 600: Sustainable Agriculture Colloquium**

(1-0) Cr. 1. Repeatable. F.S.

Weekly seminar for graduate students in the Sustainable Agriculture program.

**SUSAG 610: Foundations of Sustainable Agriculture**

(Cross-listed with A B E, AGRON, ANTHR, SOC). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**SUSAG 699: Research**

Cr. arr. Repeatable. F.S.SS.

MS and PhD thesis and dissertation research.

# IVY COLLEGE OF BUSINESS

David Spalding, Dean

Scott Johnson, Associate Dean for Research and Academic Personnel

Valentina Salotti, Associate Dean for Academic Affairs and Diversity

<https://www.ivybusiness.iastate.edu/>

## Curriculum in Business

The Ivy College of Business strives to provide a high quality professional education in business. Such an education should provide the student with: (1) an appreciation of the evolution of the profession and an awareness of the ethical, global, technological, economic, political and social forces shaping its future; (2) an understanding of the major functional areas of business with the opportunity for specialization for a career in business; (3) an ability to recognize and appreciate the effect of diversity in the work place; (4) an opportunity for advanced study.

A comprehensive education in business includes a broad foundation in the liberal arts, courses in the major functional areas of business activity, proficiency in analytical methods, and the ability to identify problems and arrive at logical solutions. In addition, a professional education is designed to inspire students to assume business and community leadership.

The curriculum in business is accredited by AACSB International, the Association to Advance Collegiate Schools of Business.

## Organization of Curriculum

The undergraduate curriculum in business is divided into three areas: general education, foundational courses, and a core major. The general education program provides a broad spectrum of liberal arts coursework.

The foundational business requirements provide a framework for business coursework. The last area includes two parts: (1) the business core which provides a common body of knowledge in all the functional areas in business, and (2) a major area of study. The twelve majors offered for the degree bachelor of science (B.S.) are accounting, actuarial science, business analytics, business economics, entrepreneurship, finance, healthcare management, human resource management, management, management information systems, marketing, and supply chain management. The college also offers a secondary major in international business. Elective courses are part of the curriculum. Additionally, the college offers the Bachelor of Business Administration (BBA) online degree completion program.

## Curriculum Changes

Iowa State University students who want to change their curriculum to the Ivy College of Business should contact the Undergraduate Programs Office for assistance. For more details on changing curriculum or majors, please visit: <https://catalog.iastate.edu/academics/#degreeplanningtext>.

Students on Academic Probation will not be allowed to change curriculum to the Ivy College of Business during enrollment period three. See Making Schedule Changes at: <http://catalog.iastate.edu/registration/#schedulechangestext>

## Academic Standards and Graduation Requirements

Policies for students enrolled in the Ivy College of Business may be obtained at <https://www.ivybusiness.iastate.edu/advising/> or from the Undergraduate Programs Office in the Ivy College of Business.

Students are responsible for knowing and adhering to these Ivy College of Business policies as well as the university regulations found in this catalog. The following policies are in effect for students graduating from a professional curriculum in business with a B.S. degree under the 2023 catalog:

1. A minimum of 122 semester credits are required for Bachelors of Science degrees.
2. At least 50 percent of the required business credits must be earned at Iowa State. All 300 level and higher business credits must be earned at a four-year institution.
3. Cumulative ISU grade point average of at least 2.0 with no quality point deficiencies.
4. The major departments reserve the right to determine the appropriate section of the degree program to which transfer credits will be assigned.
5. No more than two transfer classes can be applied to the major.
6. Students must achieve communication proficiency by earning a grade of C or better in ENGL 250, and one additional C or better from either ENGL 150 or ENGL 302.
7. A student must earn a grade of C or higher in a minimum of 30 credits applied to the business core and the major.
8. A student must earn at least 42 credits of 300 level and higher coursework from a four-year institution.
9. Business majors may not take business courses Pass-Not Pass (P/NP).
10. General education and supporting courses may not be taken P/NP.
11. No more than 9 elective credits may be taken P/NP.
12. The last 32 credits applied for graduation must be taken at ISU. A waiver for Study Abroad and Internship/Co-ops may be granted.

## Advising System

Each student in the Ivy College of Business has an assigned academic advisor who helps facilitate student progress toward graduation while supporting the academic standards of the College.



Advisors, as part of the Undergraduate Programs Office staff, provide academic services to Business students including development of academic plans, study abroad planning, accessing pertinent University services and resources, and meeting their overall educational objectives.

The College encourages students to attend an orientation program prior to their entry, where information is shared and evaluated to help set the student out on the academic path appropriate to their goals, preparation, interests, and capabilities.

## Honors

Entering freshmen who meet the criteria will be invited to apply for membership in the Freshman Honors Program by the University Honors Program. For more information on the University Honors Program, please visit: <https://www.honors.iastate.edu/program/prospective-members/first-year-admissions> (<https://www.honors.iastate.edu/program/prospective-members/first-year-admissions/>)

Currently enrolled students who have completed 12 graded credits at Iowa State University, earned a cumulative GPA of 3.50 or above, and have more than 48 credit hours remaining until graduation, are eligible to apply for membership to the University Honors Program (UHP). UHP students in the Ivy College of Business will work with designated advisors to incorporate elements of breadth, depth, and leadership into their business education through completion of academic, co-curricular, and personal/professional development experiences. In addition, to graduate with Honors in the Ivy College of Business, students must complete a minimum of two honors-designated courses, two 300-level honors seminars, an honors project, 50 credits of 300-level or higher coursework, and maintain a cumulative GPA of 3.50 or above. Additional details of requirements can be found on the Ivy College of Business Honors website at: <https://www.ivybusiness.iastate.edu/advising/honors/>

## Internships

Credit and non-credit internships in business may be approved for Ivy College of Business students in all majors. Credit hours and requirements vary, although internship credits only count as general electives. Arrangements must be made in the college prior to the beginning of the internship. A career coordinator from the Business Career Services Office will assist students in making these arrangements.

## Multiple Majors

Undergraduates pursuing a degree in the Ivy College of Business may complete additional majors in the Ivy College of Business.\* Those desiring additional majors outside the college should refer to the catalog section of the appropriate college and department for the additional major requirements. A multiple major in business economics and agricultural business or economics is not permitted. A major in business economics with a minor in economics is not permitted.

Undergraduates with a primary major outside the Ivy College of Business who want a second major in business must complete the following requirements: Foundation, Supporting Courses, Business Core, and major requirements. (Refer to the current Curriculum Guide).

All students pursuing multiple majors or multiple degrees within the Ivy College of Business are required to have a minimum of 15 credits of coursework in each major that is not used in the other majors.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

*\* BBA students cannot double major or earn a double degree in a business area. However, they may work towards a double degree in another college at Iowa State. Online minors outside of the Ivy College of Business could be added to the BBA if desired. Consult with an advisor in the Undergraduate Student Services Office for assistance in identifying online minor options.*

## Second Majors, Minors and certificates

### International Business Secondary Major

A student in the Ivy College of Business may earn a secondary major in International Business. The requirements for this major include 6 credits of international overview courses, 6 credits of business focus courses, and the completion of one of the three options for global engagement, awareness, and regional perspective. Students who pursue this secondary major will be required to complete the requirements for a primary major in Business. Fifteen of the 18 credits required for the International Business major may not be used for the primary major.

### Minor in International Business

Students with a major in the Ivy College of Business may earn a minor in International Business by completing 15 credits of approved coursework. The minor requires one course from the approved International Overview courses, two courses from the approved Business Focus courses, and by completing the Faculty-Led Global Awareness track, or the Foreign Language Global Awareness track, or through a plan of study approved by the Ivy International Programs Office. The minor must include at least six credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

### Minor in Business and Technology Consulting

The Department of Marketing offers a specialty minor open to any undergraduate student at Iowa State University. The Business and Technology Consulting minor prepares you for a career as a business consultant. Every year consulting companies attract talented graduates

across the world. As a consultant, you gain broad exposure to business issues, solve different business problems, make an impact on major businesses, and become an expert in a specific business functional area. The minor provides a systematic process for students to strengthen problem-solving skills and prepare them to become better communicators and future leaders.

The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

Non-business students may not take more than 9 credits of 300- or 400-level business courses.

## Minors for Business Students

Students with a major in the Ivy College of Business (excluding BBA students<sup>^</sup>) may qualify for a minor specialization in one of the college's departments. Minor specializations are available in: Accounting, Business Analytics, Entrepreneurship (see Entrepreneurship Cross-Disciplinary Minor below), Finance, International Business (see Minor in International Business above), Management, Management Information Systems, Marketing, and Supply Chain Management. These minors require at least 15 credit hours in the minor specialization (16 credit hours are required for a minor in Accounting), nine hours of which may not be used to satisfy any other department, college, or university requirement. The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. Students with declared majors have priority over students with declared minors in courses with space constraints.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

<sup>^</sup> BBA students can add online minors offered outside the Ivy College of Business. Consult with an advisor in the Undergraduate Student Services Office for assistance in identifying online minor options.

## Minor in General Business for Non-Business Students

The Ivy College of Business offers a structured minor in general business to students outside the College. The minor requires a minimum of 15 credits, not including pre-requisite courses. Requirements for the minor are:

Required Courses (6 credits):

ACCT 284	Financial Accounting	3
ACCT 285	Managerial Accounting	3

or ACCT 215 Legal Environment of Business

### Elective Courses (9 credits):

Select three courses from the following list:

ENTSP 310	Entrepreneurship and Innovation	3
FIN 301	Principles of Finance	3
MIS 301	Management Information Systems	3
MKT 340	Principles of Marketing	3
MGMT 370	Managing Organizations	3
SCM 301	Supply Chain Management	3

The minor must include at least 6 credits in courses numbered 300 or above taken at Iowa State University. A "C" average or better is required in courses used to satisfy the minor requirements. All requirements for the minor must be taken for a grade. Students with a major outside the Ivy College of Business are eligible for a general business minor or a minor in business and technology consulting only. They may not receive any other specific minor from a business department.

Non-Business students may not take more than 9 cr. of 300 or 400 level Business courses.

General Business minor students needing more courses to meet the "nine credit stand alone" rule will need to apply to the Ivy College of Business for an exception, or should consider taking one additional course of ACCT 285 or ACCT 215.

For more information on the General Business minor, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Undergraduate Certificates

### Professional Sales Certificate

The certificate in professional sales is a course of study administered by the Department of Marketing in the Ivy College of Business. It is designed for all undergraduate majors who wish to enhance their degree and employment possibilities by adding expertise in professional selling. The certificate program will equip students with knowledge and skills related to developing and managing mutually beneficial relationships with customers. The certificate program is built on a strong theoretical background but emphasizes applications and practice. The certificate provides students with an opportunity to learn about the ethical, technological, analytical, and global aspects of professional sales.

Students need to fulfill the course prerequisites set by the Ivy College of Business. The certificate requires 21 credits from a designated list of courses, of which, a minimum of 9 credits may not be used to meet any other department, college, or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Business courses listed as electives are available only to business majors. Non-business majors are limited to the 12 credits of required business courses for the certificate.

For more information about the Professional Sales Certificate, please visit: <https://catalog.iastate.edu/collegeofbusiness/marketing/#undergraduatecertificatetext>

**Actuarial Science Certificate**

The certificate in actuarial science is available from the *College of Liberal Arts and Sciences* for non-actuarial science majors at Iowa State. The certificate requires 23 credits from a designated list of courses, of which 9 credits must stand-alone. There are 9 prerequisite courses required for the certificate's required courses.

For more information about the Actuarial Science Certificate, please visit: <https://catalog.iastate.edu/collegeofbusiness/actuarialscience/#certificatetext>

**Entrepreneurship Cross-Disciplinary Minor**

The Ivy College of Business participates in a university-wide minor in Entrepreneurship. This minor is available to any undergraduate student. Requirements for the minor include, ENTSP 310 Entrepreneurship and Innovation (3 credits), either ENTSP 313 Feasibility Analysis for New Ventures or ENTSP 320 Corporate Entrepreneurship or ENTSP 410 Social Entrepreneurship (3 credits), two business-oriented electives from an approved list (6 credits), and an experiential learning component (3 credits). The approved list of courses is available at: <https://ivybusiness.iastate.edu/entrepreneurship-minor/>. The minor requires at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

**Non-degree Seeking Students**

Students who wish to take courses in the Ivy College of Business, but are not seeking an undergraduate degree, should apply to the college as non-degree seeking students. Non-degree seeking students are eligible to take up to 9 credits in 300-level and above business courses without meeting the college's admission requirements.

**Upper Division Courses for Students Outside the College**

Students from outside the Ivy College of Business are eligible to take up to 9 credits of 300-level and above business courses, as long as they meet course prerequisites.

**Departments of the College**

- Accounting
- Finance
- Information Systems and Business Analytics
- Management and Entrepreneurship
- Marketing
- Supply Chain Management

**Curriculum in Business**

The college offers programs of study leading to the degree bachelor of science with a major in accounting, actuarial science, business analytics, business economics, entrepreneurship, finance, healthcare management, human resource management, management, management information systems, marketing, or supply chain management.

The college also offers a secondary major in international business. Total credits required: 122

The college also offers a degree completer program leading to a bachelors of business administration (BBA). Total credits required: 120.

See also: A 4-year (8 semester) plan of study for each business degree.

**Business Curriculum**

For Actuarial Science curriculum, please go to: <https://ivybusiness.iastate.edu/degree/actuarial-science/>

For BBA curriculum, please go to: <https://ivybusiness.iastate.edu/degree/bba/>

For all Business majors, students may apply 9 P-NP credits of free electives; must earn an overall 2.00 minimum GPA; and apply only 65 credits from a 2-year institution, which may include up to 16 technical credits.

**International Perspective: 3 cr. (see footnote 3 below)**

**U.S. Diversity: 3 cr. (see footnote 4 below)**

**Communication: 13 cr.**

Proficiency met with grade of C or better in ENGL 250, and one additional C or better from either ENGL 150 or ENGL 302.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGL 302	Business Communication	3
SP CM 312	Business and Professional Speaking	3
LIB 160	Introduction to College Level Research	1

**Humanities/Social Science: 9 cr.**

9 cr. from approved humanities/social science list.

**Global Perspectives: 6 cr. (SEE Footnote 3 BELOW)**

6 cr. from approved global perspectives list.

**Natural Science: 3 cr.**

3 cr. from approved natural sciences list.

An approved list of the general education courses above are available at: <https://ivybusiness.iastate.edu/general-education-requirements/> or from the Undergraduate Student Services Office in the Ivy College of Business.

**Foundation: 20 cr.**

BUSAD 102	Business Learning Team Orientation	1
or BUSAD 103	Orientation	
BUSAD 203	Professional Development in Business	1
MATH 150	Discrete Mathematics for Business and Social Sciences <sup>1, 2</sup>	3
COM S 113	Introduction to Spreadsheets and Databases	3
ECON 101	Principles of Microeconomics	3
ECON 102	Principles of Macroeconomics	3
STAT 226	Introduction to Business Statistics I	3
ACCT 284	Financial Accounting	3
<b>Total Credits</b>		<b>20</b>

**Supporting Courses: 9-13 cr.**

*NOTE: Additional supporting courses are required for Actuarial Science. See <https://ivybusiness.iastate.edu/degree/actuarial-science/> for specific requirements for Actuarial Science.*

MATH 151	Calculus for Business and Social Sciences <sup>1</sup>	3
ACCT 215	Legal Environment of Business	3
ACCT 301	The Accounting Cycle (For ACCT majors only) <sup>1</sup>	1
MIS 207	Fundamentals of Programming for Business and Analytics (For MIS majors only) <sup>1</sup>	3
STAT 326	Introduction to Business Statistics II (For ACCT, BUSAN, BUSEC, and FIN majors only) <sup>1</sup>	3
PHIL 230	Moral Theory and Practice	3

**Business Core: 27 cr.**

ACCT 285	Managerial Accounting	3
ENTSP 310	Entrepreneurship and Innovation	3
FIN 301	Principles of Finance	3
MIS 301	Management Information Systems	3
MGMT 371	Organizational Behavior	3
MGMT 372	Ethical and Responsible Management	3
MKT 340	Principles of Marketing	3
SCM 301	Supply Chain Management	3

MGMT 478	Strategic Management <sup>*</sup>	3
<b>Total Credits</b>		<b>27</b>

<sup>\*</sup>Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

**BUSINESS MAJOR: 18-29 cr.** (depending on major)

**ELECTIVES: 0-17 cr.** (depending on major)

**FootNotes:**

<sup>1</sup> Accounting, Business Analytics, Business Economics, and Finance majors will also take STAT 326 Introduction to Business Statistics II as part of the supporting courses. Business Economics majors will take MATH 160 Survey of Calculus and ECON 207 Applied Economic Optimization instead of MATH 150 Discrete Mathematics for Business and Social Sciences and MATH 151 Calculus for Business and Social Sciences. Accounting majors will take ACCT 301 The Accounting Cycle concurrently with ACCT 285 Managerial Accounting as part of the Supporting Courses. Management Information Systems majors will take MIS 207 Fundamentals of Programming for Business and Analytics as part of the Supporting Courses.

<sup>2</sup> Students not adequately prepared in mathematics may have to take a supplemental course in addition to courses listed above.

<sup>3</sup> Students may satisfy the Global/International Perspectives requirement by taking six credit hours from the University International Perspectives list.

<sup>4</sup> Courses used for the U.S. Diversity requirements may also be used to fulfill Humanities/Social Sciences.

**Professional Programs**

The Ivy College of Business and the curriculum in Accounting are accredited by AACSB International, the Association to Advance Collegiate Schools of Business.

**Accounting major: 21 cr.**

<https://ivybusiness.iastate.edu/degree/accounting/>

**Actuarial Science major: 23 cr.**

<https://ivybusiness.iastate.edu/degree/actuarial-science/>

**Business Analytics major: 21 cr.**

<https://ivybusiness.iastate.edu/degree/business-a/>

**Business Economics major: 19 cr.**

<https://ivybusiness.iastate.edu/degree/business-economics/>

**Entrepreneurship major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/entrepreneurship/>

**Finance major: 21 cr.**

<https://ivybusiness.iastate.edu/degree/finance/>

**Healthcare management major: 24 cr.**

<https://ivybusiness.iastate.edu/degree/healthcare-management/>

**Human Resource Management Major: 21 Cr.**

<https://www.ivybusiness.iastate.edu/degree/human-resource-management/>

**Management major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/management/>

**Management Information Systems major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/management-information-systems/>

**Marketing major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/marketing/>

**Supply Chain Management major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/supply-chain-management/>

**International Business *Secondary* major: 18 cr.**

<https://ivybusiness.iastate.edu/degree/international-business/>

**Bachelors of Business Administration degree: 21 Cr.**

<https://www.ivybusiness.iastate.edu/degree/bba/>

## Bachelor of Science

The bachelor of science (B.S.) degree offers a high quality professional education in business. It prepares students for professional careers in specialized functions of business and government. Candidates for this degree must satisfy the requirements established by the Ivy College of Business and also the requirements for individual majors specified by the departments of the College. All candidates for the B.S. degree are required to complete one of the following majors: accounting, actuarial science, business analytics, business economics, entrepreneurship, finance, healthcare management, human resource management, management, management information systems, marketing, or supply chain management.

## Majors

Accounting  
Actuarial Science  
Business Analytics  
Business Economics  
Entrepreneurship  
Finance  
Healthcare Management  
Human Resource Management  
International Business (second major only)  
Management  
Management Information Systems  
Marketing  
Supply Chain Management

Bachelors of Business Administration (online degree completer program)

## Minors

**For Business Majors Only**

Accounting  
Business Analytics  
Business and Technology Consulting  
Entrepreneurship  
Finance  
International Business  
Management  
Management Information Systems  
Marketing  
Supply Chain Management

**For Non-Business Majors**

Business and Technology Consulting (<http://catalog.iastate.edu/collegeofbusiness/marketing/#undergraduateminortext>)

General Business Minor

Entrepreneurship

## Certificates

**For any ISU major**

Professional Sales Certificate

## GRADUATE STUDY

### Masters Programs

Eight programs are offered at the master's level: a master of business administration (MBA), a master of accounting (MAcc), a master of business analytics (MBAN), a master of entrepreneurship (MEP), a master of finance (MFIN), a masters in healthcare analytics and operations (MHAO), a master of real estate development (MRED), and a master of science in information systems (MSIS). These programs are intended to meet distinct sets of educational objectives.

The master of business administration (MBA) is the professional management education program for those pursuing careers in business.

The goal of the MBA program is to educate future business leaders preparing them for the challenges of tomorrow by giving them the vision, knowledge, skills, and confidence to make the best decisions for all involved stakeholders. The MBA program consists of a 48-credit curriculum leading to a non-thesis, non-creative component master of business administration. Students may pursue a specialization in accounting, accounting analytics, business analytics, entrepreneurship, finance, healthcare analytics and operations, information systems, leadership, marketing, real estate, or supply chain management.

The Ivy College of Business also offers a business administration minor to students with majors outside the college. For more information on



the graduate minor in business administration, please visit: <https://ivybusiness.iastate.edu/degree/zgraduate-minors/>

A concurrent BS/MBA is available to eligible engineering undergraduate students majoring in aerospace, agricultural, biological systems, chemical, civil, computer, construction, cybersecurity, electrical, industrial, materials science, mechanical, or software engineering. A concurrent BS/MBA is available to eligible undergraduate students majoring in agricultural systems technology, agronomy, animal science, chemistry, computer science, food science, geology, industrial design, industrial technology, and meteorology.

Double master's degree programs are offered with accounting (MBA/MAcc), architecture (MBA/MArch), business analytics (MBA/MBAN), community and regional planning (MBA/MCRP), entrepreneurship (MBA/MEP), finance (MBA/MFIN), healthcare analytics and operations (MBA/MHAO), information systems (MBA/MSIS), and real estate development (MBA/MRED). A double degree program (DVM/MBA) is also available to eligible Veterinary Medicine students.

Multiple concurrent degree programs are offered between the Ivy College of Business and other Colleges at ISU. The concurrent degree programs allow qualified students to be admitted to a Masters program while completing their undergraduate degree. Students can double count up to 6 credits of coursework between the degrees, allowing them to complete both a Bachelors of Science and a Master's degree in as little as five years. The concurrent degree programs offered include:

- B.S. Business Analytics (BUSAN) and Master of Business Analytics (MBAN)
- B.S. Business Analytics (BUSAN) and Master of Science in Information Systems (MSIS)
- B.S. Finance (FIN) and Master of Finance (MFIN)
- B.S. Management Information Systems (MIS) and Master of Science in Information Systems (MSIS)
- B.S. Management Information Systems (MIS) and Master of Business Analytics (MBAN)
- B.S. Software Engineering (S E) and Master of Science in Information Systems (MSIS)

For more information on the concurrent Bachelors and Masters programs offered through the Ivy College, please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

The master of accounting (MAcc) is designed to meet the needs of accountants in public or private accounting, focusing on interpreting and analyzing accounting information for decision-making and preparing students for certification as a Certified Public Accountant (CPA) or Certified Management Accountant (CMA). The 30-hour program requires 15 hours of graduate accounting courses, including courses in data

analytics and communications. Students may pursue a specialization in Financial Reporting and Assurance, Information Systems and Analytics, Tax, or Managerial Decision Making.

The master of business analytics (MBAN) is an interdisciplinary program that addresses the challenges of dealing with data analytics and business intelligence in the "Big Data" environment. The goal is to develop managers who will master analytics in ways that lead to increased profits for their company. The program, offered both online or in-person, offers a comprehensive approach that draws from Business, Computer Science, Electrical and Computer Engineering, Statistics, and Industrial and Manufacturing Systems Engineering. It provides a foundation in data analytics project management, statistical and predictive modeling, consumer sentiment analysis, knowledge discovery, analytical reporting, segmentation analysis and data visualization. The program requires 30 credits of graduate level courses over a 21 month period.

A certificate in business analytics is also available for working professionals. The certificate requires a minimum of 12 graduate level approved credits, which may be taken either on-line or face-to-face. For more information on the graduate certificate in business analytics, please visit: <http://catalog.iastate.edu/collegeofbusiness/businessanalytics/#graduatecertificatetext>

The master of finance (MFIN) is designed to provide students with in-depth coverage of financial topics and a strong quantitative skill set. Students will learn financial analysis, valuation, modeling, and risk management techniques. The 30-credit program requires 24 finance credits, of which 6 are finance electives. The remaining 6 credits are electives selected from any related area.

A certificate in finance is also available. The certificate requires a minimum of 12 graduate level approved credits, which may only be taken face-to-face. For more information on the graduate certificate in finance, please visit: <http://catalog.iastate.edu/collegeofbusiness/finance/#graduatecertificatetext>

Students graduating from the Masters in Healthcare Analytics and Operations (MHAO) program will apply data and appropriate models to analyze operations and supply chains to develop and present actionable insights leading to better outcomes in the healthcare industry.

Healthcare analytics uses historical and current data to predict trends and optimize operations, bringing benefits to patients, medical professionals, and healthcare supply chain partners.

The Master of Real Estate Development (MRED) is a 30-credit non-thesis, non-creative component program. The MRED program offers academic training, networking opportunities and collaboration with leading academics and practitioners to solve real world problems. Areas of study include real estate market analysis, finance, investments,



leadership and negotiation, fundamentals of the build environment, construction science and urban planning. The curriculum is offered in a convenient format of distance learning and brief campus residencies, making it ideal for the full-time working professional.

The master of science in information systems (MSIS) is designed to provide students with strong technical skills and a broad background in business needed to effectively develop and manage information systems projects. Using the latest software, students will apply information systems theory and concepts to modern information systems development. The 30 credit program includes business foundation courses, information systems core courses and electives, and a research requirement (creative component).

A certificate in supply chain management is also available. The certificate requires a minimum of 12 graduate level approved credits, which may only be taken on-line. For more information on the graduate certificate in supply chain management, please visit: <http://catalog.iastate.edu/collegeofbusiness/supplychainmanagement/#graduatecertificatetext>

A certificate in enterprise cybersecurity management is also available. The certificate requires a minimum of 12 graduate level approved credits, which may be taken either on-line or face-to-face. For more information on the graduate certificate in enterprise cybersecurity management, please visit: <http://catalog.iastate.edu/collegeofbusiness/managementinformationsystems/#graduatecertificatetext>

The Master of Entrepreneurship (MEP) is designed to provide students with the knowledge, skills, and practical experience to prepare student to start and manage new business ventures independently – or within an established organization. Students will develop and practice the primary entrepreneurial skills needed to identify and evaluate market opportunities and think creatively to formulate and implement successful strategies for moving a business idea forward. The 30-credit program requires both core and elective credit in addition to experiential components.

A certificate in entrepreneurship and innovation is also available. The certificate requires a minimum of 12 graduate level approved credits, which may be taken either on-line or face-to-face. For more information on the graduate certificate in entrepreneurship and innovation, please visit: <http://catalog.iastate.edu/collegeofbusiness/entrepreneurship/#graduatecertificatetext>

A certificate in Digital Marketplace Analytics is offered by the Ivy College of Business and the College of Human Sciences. The 15-credit certificate, which incorporates coursework from both colleges, provides an innovative program for individuals who want to build their data analytics skills and to apply analytics tools to problem-solving in the fashion, events, and hospitality industries. For more information on the graduate certificate in digital marketplace analytics, please

visit: <http://catalog.iastate.edu/collegeofbusiness/businessanalytics/#graduatecertificatetext>

The Ivy College of Business participates in the following graduate level interdepartmental programs: Cyber Security, Engineering Management, Human Computer Interaction, Seed Technology and Business, and Transportation.

## Ph.D. in Business and Technology

The Ivy College of Business offers graduate work leading to the Doctor of Philosophy degree in business and technology, with one of six specializations—entrepreneurship (ENTSP), finance, (FIN), management information systems (MIS), management (MGMT), marketing (MKT), or supply chain management (SCM). Departments in the college (Finance, Management and Entrepreneurship, Marketing, Supply Chain Management, and Information Systems and Business Analytics), along with select other departments from across campus cooperate in providing coursework toward this degree. The program prepares individuals for academic careers in research, teaching, and public service at institutions of higher learning in the United States and other countries. The program consists of seminars in content areas, statistics, and research methodology in the first two years. After passing comprehensive exams, students will focus on their dissertation.

This 74-credit program requires a minimum of four years to complete. All work, including the dissertation, must be done in residence (on campus).

For more details or application information contact the Graduate Programs office in the Ivy College of Business or visit: <https://ivybusiness.iastate.edu/phd/>

## Accounting

Accountants are the business leaders in corporations and governments who manage, analyze, and explain complex information. Accountants are at the forefront of data analytics and lead the planning, evaluating, controlling, and reporting of activities in an entity.

The major in accounting is designed to give students a conceptual foundation, developing their financial acumen and analytical skills for use in every facet of business. Students who complete the accounting major are well prepared for careers in industry, government, and the public accounting profession.

Accountants both provide and explain useful financial information to internal users (such as managers in a company) and external users (such as investors, creditors, government officials, and the general public). Accounting is an integral part of the management of business and government organizations. Accounting information is needed by external users to make investment decisions, to grant or withhold credit, and in the case of government, to collect revenue and gather statistical

information. To provide useful information, accountants collect, analyze, synthesize, and communicate data in an understandable manner.

The curriculum in accounting is accredited by AACSB International, the Association to Advance Collegiate Schools of Business.

## Undergraduate Major in Accounting

**For undergraduate curriculum in business, major in accounting.**

The Department of Accounting offers a major in accounting. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (BS) degree, and 24 additional credits in the major.

The instructional objective of the Accounting Program is to provide a well-rounded professional education in accounting. Such an education should provide the student with:

1. a mastery of basic accounting concepts
2. an ability to solve accounting problems and analyze accounting issues utilizing critical thinking
3. an ability to communicate effectively and work with others as a member of a team
4. an awareness and sensitivity for dealing with ethical concerns.

For more information on the undergraduate major in Accounting, please visit: <https://ivybusiness.iastate.edu/degree/accounting/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Accounting will:

1. Learners will possess fundamental accounting knowledge
2. Learners will be effective communicators
3. Learners will be critical thinkers
4. Learners will be skilled in the use of information technology
5. Learners will be effective team members
6. Learners will be ethical decision makers

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>), the requirements for the accounting major are met by successful completion of the following courses:

Required Courses (18 credits):

ACCT 383	Intermediate Managerial Accounting	3
ACCT 384	Accounting Information Systems and Analytics	3
ACCT 386	Intermediate Financial Accounting I	3
ACCT 387	Intermediate Financial Accounting II	3

ACCT 485	Principles of Federal Income Tax	3
ACCT 497	Introduction to Auditing	3

Elective Courses (6 credits):

Select six credit hours from the following list:

ACCT 315	Business Data Streams and Issues	3
ACCT 461	Entrepreneurship and Accounting Information	3
ACCT 483	Application and Communication in Managerial Accounting	3
ACCT 484	Advanced Accounting Information Systems	3
ACCT 487	Volunteer Income Tax Assistance	3
ACCT 488	Governmental and Non-profit Institution Accounting	3
ACCT 489	Corporate Social Responsibility Reporting	3
ACCT 493	Corporate Taxation	3
ACCT 495	Advanced Financial Accounting Problems	3
ACCT 496	Accounting in the Global Economy	3
ACCT 498	Accounting Communication and Analysis	3

NOTE: Accounting majors must take ACCT 301 The Accounting Cycle and STAT 326 Introduction to Business Statistics II as part of the supporting courses.

See the CPA Licensure Note below for the 150-hour education requirement for CPA certification in Iowa.

In addition, it is highly recommended that an accounting major include ACCT 416 Business Law. The Department of Accounting should be consulted for information on alternative plans of study.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

**CPA Licensure Note:** The CPA licensure designation is a symbol of competence in the accounting profession, which employers value both immediately upon graduation and throughout career advancement. While students may sit for the CPA exam in Iowa after completing the required accounting coursework and earning a bachelor's degree, CPA candidates must complete a total of 150 credits in order to be certified or licensed to practice in Iowa. Qualified students should consider earning the Master of Accounting (MAcc) to satisfy the 150-credit requirement. Juniors and seniors in accounting who are interested in graduate study should contact the coordinator of the MAcc program as early as possible to complete their graduate degree in an efficient manner. *Students planning certification outside Iowa must check local rules, as each state determines its own CPA exam qualification and licensing requirements.*

Accounting, B.S.

*Sample 4-Year Plan (Your plan may differ)***Freshman**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 ACCT 284	3
COM S 113	3 HUM/SOC SCI	3
ENGL 150	3 STAT 226	3
MATH 150	3 PHIL 230	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MATH 151	3 SP CM 312	3
ACCT 285	3 ACCT 215	3
ACCT 301	1 ACCT 386	3
ENGL 250	3 STAT 326	3
MIS 301	3 Natural Science	3
US Diversity <sup>#</sup>	3	
	<b>16</b>	<b>15</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ACCT 387	3 ACCT 383	3
Global/International Perspective <sup>@</sup>	3 ACCT 384	3
Core Business Course	6 Core Business Courses	6
HUM/SOC SCI	3 ENGL 302	3
	<b>15</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ACCT 485	3 MGMT 478 <sup>*</sup>	3
ACCT 497	3 ACCT Elective	6
Core Business Courses	6 HUM/SOC SCI	3
General Electives	3 Global/International Perspective <sup>@</sup>	3
	General Elective	1
	<b>15</b>	<b>16</b>

**Total Credits: 122**<sup>@</sup> Courses in these requirements may also be used as Global Perspective.<sup>#</sup> US Diversity courses may be used to satisfy HUM/SOC SCI.

<sup>\*</sup> Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

## Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

**Undergraduate Minor in Accounting**

The Department of Accounting also offers a minor for non-Accounting majors in the Ivy College of Business. The minor requires 16 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

## Required Courses (7 credits):

ACCT 284	Financial Accounting	3
ACCT 285	Managerial Accounting	3
ACCT 301	The Accounting Cycle	1

## Elective Courses (9 credits):

Select nine credit hours from 300 or 400 level Accounting courses, except ACCT 416.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Accounting, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Master of Accounting (MAcc) 4+1 Program

The Master of Accounting (MAcc) is a 30-credit hour, non-thesis graduate program with six credits dedicated to CPA exam preparation. This path allows students the time necessary to adequately study for and complete all four sections of the CPA exam before starting a full-time job. In addition, the program provides a solution to satisfying the 150 total credit hour CPA requirement while earning a higher degree!

Each MAcc student customizes their curriculum to fit their interests and intended career path. Both a CPA certification track and CMA certification track are available. Within their selected track, students earn a specialization in one of the following areas of their choice: financial reporting and assurance, information systems and analytics, tax, or managerial decision-making. A three-week, six-credit study abroad option in London is available.

Students considering the MAcc should meet with Kayla Sander, MAcc coordinator and advisor, during the first semester of their junior year.

Students are required to apply for the program the semester before beginning graduate coursework. For more information and a more detailed program outline, visit: <http://www.ivybusiness.iastate.edu/degree/macc> (<http://www.ivybusiness.iastate.edu/degree/macc/>).

## MAcc 4+1 Program Highlights

### Freshman Spring

#### ACCT 284: Financial Accounting

(3-0) Cr. 3. F.S.SS.

Introduction to the basic concepts and procedures of financial accounting from a user perspective. The course examines the accounting cycle, business terminology, basic control procedures, and the preparation and evaluation of financial reports, with an emphasis on financial statement analysis.

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### Sophomore Fall

#### ACCT 301: The Accounting Cycle

(1-0) Cr. 1. F.S.SS.

*Prereq: ACCT 284*

Interactive computer-based analysis of the accounting cycle including transactions and financial statements. Preparation of journal entries and adjusting entries and completion of the closing process.

#### ACCT 285: Managerial Accounting

(3-0) Cr. 3. F.S.SS.

*Prereq: ACCT 284*

Understanding of fixed and variable costs and their role in planning, control and performance evaluation. Examination of alternative costing methods. Making decisions by identifying and developing relevant information. Development of spreadsheet skills.

#### MIS 301: Management Information Systems

(3-0) Cr. 3.

*Prereq: COM S 113*

The role of information technology in organizations. Overview of methodologies for design and development of systems including decision support systems, expert systems, data bases, end-user computing, etc. Computer applications relate concepts to practice. Lecture and laboratory work emphasizes the enabling role of IT in contemporary organizations.

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### Sophomore Spring

#### ACCT 386: Intermediate Financial Accounting I

(3-0) Cr. 3. F.S.

*Prereq: ACCT 284 and ACCT 301*

The conceptual framework of financial accounting. Communication of financial information on the income and retained earnings statements, statement of cash flows, and the balance sheet. Accounting concepts relating to current and operational assets of the firm.

#### STAT 226: Introduction to Business Statistics I

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 150 or MATH 165*

Obtaining, organizing, and presenting statistical data; measures of location and dispersion; the Normal distribution; sampling and sampling distribution of the sample mean; elements of statistical inference; confidence intervals and hypothesis testing for the mean; describing bivariate relationships and inference for simple linear regression analysis; use of computers to visualize and analyze data. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

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### Junior Fall

#### ACCT 387: Intermediate Financial Accounting II

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in ACCT 386*

Financial accounting and reporting practices for business entities. Generally accepted accounting principles (GAAP) relative to firm liabilities, equity, income, taxes, employee benefits, leases, accounting changes and cash flows. Discussion of current issues in financial accounting.

**Plan MAcc Program****Junior Spring****ACCT 383: Intermediate Managerial Accounting**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 285; credit or concurrent enrollment in ACCT 301*

Generation, communication and use of information to assist management with planning, control, and decision making in manufacturing and service organizations. Includes cost concepts and relevance to decision situations, operational and capital budgeting, and performance evaluation. Emphasis on developing effective teamwork skills as well as spreadsheet capabilities.

**ACCT 384: Accounting Information Systems and Analytics**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in ACCT 301; credit or concurrent enrollment in MIS 301*

Concepts and procedures underlying creating, sharing, reporting, storing, and analyzing accounting data. Information technology internal controls and audit techniques. Trends in accounting information systems.

**Senior Fall****ACCT 485: Principles of Federal Income Tax**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in ACCT 386 or ACCT 501*

Introduction to the fundamentals of federal income taxation and concepts applicable to all tax entities. Addresses issues related to the measurement and recognition of income, deductions, gains, and losses, taxation of property transactions, and basis / cost recovery concepts. Includes coverage of tax law policy objectives, tax implications of business and investment decisions, tax versus financial reporting treatment of common business transactions, and ethical issues related to tax compliance and planning.

**ACCT 497: Introduction to Auditing**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 384, ACCT 387 and STAT 326*

The conceptual framework of auditing. Professional ethics. External reporting concepts. Audit methodology including risk analysis, internal control, procedures for gathering evidence and the role of statistical sampling in auditing.

**Apply to MAcc Program****Senior Spring****Two (2) ACCT Electives*****Optional Concurrent Status to Get Started on MAcc Requirements Early!*****Senior Summer*****Optional Study Abroad in London*****Graduate Fall****ACCT 515: Accounting Analytics**

Cr. 3. F.

*Prereq: ACCT 384 or Permission of Department*

Applications and skills for performing data analytics in accounting contexts. Explores conceptual framework for providing data-driven insights and recommendations. Includes hands-on experiences working with different types of data and the latest analysis tools.

**ACCT 598: Financial Accounting: Theory and Contemporary Issues**

(3-0) Cr. 3. F.

*Prereq: ACCT 386 or ACCT 501*

Theoretical discussion of the financial accounting and reporting environment. The usefulness of financial accounting information for decision making. Current financial accounting issues, the financial accounting standard setting process, FASB Standards Codification, and the role of the SEC in financial reporting.

**ENGL 592C: Core Studies: Professional Communication**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 9 credits. Seminar on topics central to the fields of rhetoric and professional communication or composition.

**CPA or CMA Exam Prep Specialization Coursework**

Please address MAcc questions to Kayla Sander, MAcc coordinator and advisor, at [kayla@iastate.edu](mailto:kayla@iastate.edu). An *Accounting Student Resources* folder, available to all Ivy accounting majors, is found in Canvas. This folder provides useful, detailed information on both the CPA exam and the Iowa State University Master of Accounting 4+1 program.

**Graduate Programs****Master of Accounting (MAcc)**

The department offers a graduate degree, the master of accounting (MAcc). This is a 30-credit hour degree which offers paths to certification as a Certified Public Accountant (CPA) or Certified Management Accountant (CMA). Areas of specialization are also available within those 30 hours. Students pursuing the CPA certification may specialize in Financial Reporting and Assurance, Information Systems and Analytics, or Tax. Students pursuing the CMA certification may specialize in Managerial Decision Making or Information Systems and Analytics. The program requires 15 hours of core courses which include ENGL 592C Core Studies: Professional Communication, ACCT 515 Accounting Analytics, ACCT 598 Financial Accounting: Theory and Contemporary Issues, and two Certification Preparation courses. The remaining



15 hours of the degree are determined by the selection of an area of specialization.

The MAcc is appropriate for accounting undergraduate students wanting to pursue a variety of accounting careers. The MAcc program is an efficient way for candidates to meet the 150-hour education requirement for CPA certification in Iowa. Students without an accounting degree will be required to complete a substantial amount of accounting coursework prior to being considered for admission to the MAcc. Contact the coordinator of the MAcc program for details.

## Student Learning Outcomes

Upon graduation, master of accounting (MAcc) students will:

1. Be critical thinkers
2. Be effective communicators
3. Be effective team members
4. Be ethical decision makers
5. Be adequately prepared for professional certification or licensure

For more information about the MAcc program, please visit: <https://ivybusiness.iastate.edu/degree/macc/>

## Double Graduate Degrees

The Accounting Department participates in one double degree program at the graduate level. Students can simultaneously pursue a double degree in Master of Business Administration (MBA) and Master of Accounting (MAcc). The double degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on the double degree in Master of Business Administration (MBA) and Master of Accounting (MAcc), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## Master of Business Administration (MBA)

The Department of Accounting participates in the full-time, part-time, and executive Master of Business Administration (MBA) programs. The MBA is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students may develop an area of specialization in accounting or accounting analytics.

The specialization in accounting is designed to help meet the education requirement for CPA certification in Iowa.

The specialization in accounting analytics will place students a step ahead in today's business environment. The specialization curriculum provides a deep dive into a well-rounded selection of accounting topics while placing an emphasis on expanding students' analytical skills - skills critical to the accounting profession.

## Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Accounting or Accounting Analytics, please visit: <https://ivybusiness.iastate.edu/degree/mba/>

## Actuarial Science

Actuaries have a deep understanding of finance, business, mathematics, and statistics. With this knowledge, they help businesses measure and manage risk, develop new products, and make strategic value-enhancing decisions. In high demand, actuaries work for and with businesses engaged in many different types of activities, including life-, health-, and property-casualty insurance, banking, investments, financial services, government, energy, e-commerce, marketing, and consulting.

Students studying actuarial science will acquire the knowledge base and skills in finance, mathematics, and statistics needed to pass the preliminary actuarial exams offered by the Society of Actuaries and Casualty Society of America, while acquiring essential business skills to be successful in the field.

## Undergraduate Major

*The Department of Finance in the Ivy College of Business* offers a major in actuarial science. Students will complete the business general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (B.S.) degree, and 23 additional credits in the major.

The actuarial science major, intended for students with strong quantitative backgrounds and interest in business, has the goal of educating students in business and risk management, while providing the background and training needed for certification as an actuary (via the 5 preliminary exams of the profession). The major is an excellent opportunity for individuals who want to use advanced technical and analytical skills to solve important business problems.

## Certificate

The certificate in actuarial science is available from the *College of Liberal Arts and Sciences* for non-actuarial science majors at Iowa State (or students who hold a baccalaureate degree from an accredited institution). The certificate requires 23 credits from a designated list of courses, of which 9 credits must stand-alone. There are 9 prerequisite courses required for the certificate's required courses.



The certificate is intended for students who wish to prepare for a career in the field while obtaining the advanced technical and analytical skills in their chosen major. Students studying mathematics, statistics, or other quantitative STEM disciplines will find their primary coursework matches well with the prerequisites and courses required for the certificate.

Students completing the certificate will have sufficient background to pass the first 4 preliminary exams of the profession, along with applying actuarial mathematics to problems in finance, investments, and risk analysis for a broad range of businesses and consumers.

#### **For undergraduate curriculum in business, major in actuarial science.**

The Department of Finance offers a major in actuarial science. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (B.S.) degree, and 23 additional credits in the major.

Actuaries measure and manage risk and work for and with businesses with a financial focus, such as finance and insurance. The actuarial science program provides a background in probability, statistics, finance, and actuarial mathematics to enable students to pass the 5 preliminary exams offered by the Society of Actuaries and Casualty Society of America. After completion of this program, students will acquire the business-related skills needed to be a successful actuary. These include the ability to: understand how a business is organized and functions; communicate effectively in written, oral, visual, and electronic modes; work in teams; make ethical choices; use quantitative and analytical methods to address unstructured business problems; think critically; understand financial statements; and understand markets and investments.

Areas of study in the field of actuarial science include interest theory, theory of probability, financial futures and options, loss models, credibility theory, and mathematics of life contingencies.

The instructional objective of the Actuarial Science program is to provide a well-rounded professional business education in actuarial science. Such a program will provide the student with:

1. a mastery of actuarial concepts and methods of analysis
2. a basic understanding of insurance operations in a global setting and of the role of financial institutions in the economy
3. an ability to effectively communicate and work with others as an actuary
4. an ability to demonstrate leadership capabilities in actuarial, financial analysis, and portfolio management.

For more information on the undergraduate major in Actuarial Science, please visit: <https://ivybusiness.iastate.edu/degree/actuarial-science/>

## **Student Learning Outcomes**

Upon graduation, undergraduate students majoring in Actuarial Science will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## **Curriculum:**

While the General Education Requirements for Actuarial Science majors remains the same as all other Business majors, there are specific changes in the following areas that must be completed in order to receive a Bachelor's degree in Actuarial Science:

### **Foundation: (21)**

BUSAD 102	Business Learning Team Orientation	1
or BUSAD 103	Orientation	
BUSAD 203	Professional Development in Business	1
COM S 113	Introduction to Spreadsheets and Databases	3
MATH 165	Calculus I	4
ECON 101	Principles of Microeconomics	3
ECON 102	Principles of Macroeconomics	3
STAT 226	Introduction to Business Statistics I	3
ACCT 284	Financial Accounting	3

### **Supporting Courses: (17)**

ACCT 215	Legal Environment of Business	3
MATH 166	Calculus II	4
MATH 207	Matrices and Linear Algebra	3
MATH 265	Calculus III	4
PHIL 230	Moral Theory and Practice	3

### **Business Core: (27)**

ACCT 285	Managerial Accounting	3
ENTSP 310	Entrepreneurship and Innovation	3
FIN 301	Principles of Finance	3
MGMT 371	Organizational Behavior	3
MGMT 372	Ethical and Responsible Management	3
MIS 301	Management Information Systems	3
MKT 340	Principles of Marketing	3
SCM 301	Supply Chain Management	3

Above courses are prerequisites and must be taken prior to:

MGMT 478	Strategic Management	3
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**Major – Actuarial Science: (23)**

## Required Courses:

MATH 240	Mathematics of Investment and Credit	3
STAT 341	Introduction to the Theory of Probability and Statistics I	4
STAT 342	Introduction to the Theory of Probability and Statistics II	4
FIN 455	Risk Modeling	3
ACSCI 401	Loss Models I	3
ACSCI 402	Credibility Theory	3
MATH 441	Life Contingencies I	3

## Elective Courses:

The following electives are highly recommended for Actuarial Science majors:

ACSCI 391	Actuarial Exam P Lab	1
ACSCI 392	Actuarial Exam FM Lab	1
FIN 310	Corporate Finance	3
FIN 424	Financial Futures and Options	3
MATH 442	Life Contingencies II	3

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Actuarial Science, B.S.

*Sample 4-Year Plan (Your plan may differ)*

**Freshman**

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ACCT 284*	3
ECON 101*	3 ECON 102*	3
COM S 113	3 MATH 166	4
ENGL 150	3 HUM/SOC SCI	3
MATH 165	4 STAT 226	3
PHIL 230	3 BUSAD 203	1
	<b>17</b>	<b>17</b>

**Sophomore**

Fall	Credits Spring	Credits
ACCT 285	3 Business Core Course	6
MATH 240	3 STAT 341	4
MATH 265	4 ENGL 250	3
FIN 301*	3 Global/International Perspective@	3

Recommended ACSCI elective from list	1 LIB 160	1
(Students should take FM exam during winter break)	(Students should take P exam summer after sophomore year)	

**14 17**

**Junior**

Fall	Credits Spring	Credits
MATH 207	3 FIN 455	3
ACSCI 401	3 ACSCI 402	3
Business Core Course	3 STAT 342*	4
SP CM 312	3 Business Core Course	3
Natural Science	3 US Diversity#	3
	(Students should take IFM (or STAM) exam summer after junior year)	

**15 16**

**Senior**

Fall	Credits Spring	Credits
MATH 441	3 Global/International Perspective@	3
Business Core Courses	3 ACCT 215	3
ENGL 302	3 MGMT 478**	3
HUM/SOC SCI	3 General Elective	3
Recommended ACSCI elective from list	2 (Students should take LTAM exam)	
(Students should take STAM (or IFM) exam during winter break)		

**14 12**

**Total Credits: 122**

- @ Courses in these requirements may also be used as Global Perspective.
- # US Diversity courses may be used to satisfy HUM/SOC SCI.
- \* Validation of Educational Experience courses
- \*\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

FM	= Financial Mathematics exam
P	= Probability exam
IFM	= Investments & Financial Markets exam
STAM	= Short-Term Actuarial Mathematics exam
LTAM	= Long-Term Actuarial Mathematics exam

Graduation Requirements:

- 1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
- 2. 42 credits of 300+ level courses from a four-year institution.
- 3. 50% of required Business courses must be earned at ISU.
- 4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
- 5. 131 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
- 6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
- 7. A grade of C- or better in MATH 166 and MATH 265 required.
- 8. All 300-level and higher business credits must be earned at a four-year college.
- 9. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Undergraduate Certificate

For the undergraduate certificate in actuarial science.

### Purpose

The College of Liberal Arts and Sciences offers a certificate in Actuarial Science. It is available to any non-Actuarial Science major (or student who holds a baccalaureate degree from an accredited institution). Students studying mathematics, statistics, or other quantitative STEM disciplines will find their primary coursework matches well with the prerequisites and courses required for the certificate. The certificate provides students with the necessary background in mathematics, statistics, and the basic principles of finance for a career in actuarial science while obtaining advanced technical and analytical skills in their chosen major. Students completing the certificate will have the background to pass 4 of the preliminary exams in the profession, will have obtained the specialized knowledge required for success in the field, and will be prepared to work for and with businesses with a financial focus, such as insurance, banking, and investments.

### Learning Outcomes

After completing the certificate in actuarial science, students will:

- master the quantitative and analytical skills required to obtain an entry-level position in the profession,

- have sufficient background to pass the first 3 or 4 professional exams offered by the professional actuarial organizations,
- apply actuarial mathematics to problems in finance, investment, and risk analysis, and
- demonstrate the ability to communicate the results of quantitative analysis, both in writing and orally.

## Requirements

The certificate in actuarial science requires the completion of 7 courses, totaling 23 credit hours.

These courses are:

FIN 320	Investments	3
FIN 424	Financial Futures and Options	3
MATH 240	Mathematics of Investment and Credit	3
MATH 441	Life Contingencies I	3
MATH 442	Life Contingencies II	3
STAT 341	Introduction to the Theory of Probability and Statistics I	4
STAT 342	Introduction to the Theory of Probability and Statistics II	4

The seven courses in the list above require 9 prerequisite courses. These courses are: ACCT 284, ECON 101, FIN 301, MATH 165, MATH 166, MATH 265, MATH 207 or 317, STAT 226 (or another introductory statistics course: STAT 101, 104, 105, 201, 231, 305, 322 or 330), and STAT 326 (or STAT 301).

In order to be admitted to the certificate program, students must complete ACCT 284, ECON 101, MATH 165, MATH 166, and STAT 226 (or another introductory statistics course) with a cumulative GPA of at least 2.5.

At least 9 credits used for the certificate cannot be used to meet any other department, college or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Courses for the certificate cannot be taken on a pass/not-pass basis.

A cumulative GPA of at least 2.0 is required in the seven courses for the certificate.

## Business Administration

The Business Administration unit supports graduate and undergraduate programs in the departments of Accounting, Finance, Management and Entrepreneurship, Marketing, Supply Chain Management, and Information Systems and Business Analytics, by providing specialized coursework

in orientation to business, professional development, and cooperative education opportunities.

## Undergraduate Bachelor of Business Administration (BBA) Degree

**For undergraduate curriculum in business, bachelor of business administration.**

The Department of Management and Entrepreneurship offers an undergraduate bachelor of business administration (BBA) degree. This degree-completer program is a general business degree that is offered online. The BBA is accessible if you have some prior college experience, and is aimed at working professionals with at least 45 college credits.

Students will complete the general education requirements (including business foundation courses), business core requirements for the bachelor of business administration (BBA) degree, and 21 additional credits in the major.

The instructional objective of the BBA degree is to learn the foundation in all areas of business, and then through the required and elective upper-level coursework, build out specialized knowledge in specific areas of business to align with your personal and professional interests and include an emphasis on critical management and leadership skills. By enrolling in the BBA program, you will be able to balance full time employment, or other personal commitments, and the completion of a four-year degree in business.

The major-specific coursework targets the following skills:

- Managing projects
- Negotiating and resolving conflicts
- Managing human resources
- Managing the supply chain
- Managing finances
- Managing a global and diverse workforce
- Managing sales and understanding consumer behavior

For more information on the undergraduate bachelor of business administration, please visit: <https://www.ivybusiness.iastate.edu/degree/bba/>

## Student Learning Outcomes

Upon graduation, undergraduate students receiving a bachelors in Business Administration will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

The department of Management and Entrepreneurship offers a fully online degree-completer program leading to a general business degree.

This degree-completer program consists of 21 credits of coursework in the business administration major, including 9 credit hours of required courses, and 12 credit hours of major electives.

The General Education Requirements for the Bachelor of Business Administration degree are different from all other Business majors. There are specific changes in the following areas (including global & international perspectives, humanities, social sciences, and natural sciences) that must be completed in order to receive a Bachelor's degree in Business Administration.

### Foundation: (17)

BUSAD 103	Orientation	1
BUSAD 203	Professional Development in Business	1
COM S 113	Introduction to Spreadsheets and Databases	3
MATH 150	Discrete Mathematics for Business and Social Sciences	3
ECON 101	Principles of Microeconomics	3
or ECON 102	Principles of Macroeconomics	
STAT 226	Introduction to Business Statistics I *	3
ACCT 284	Financial Accounting	3

### Supporting Courses: (3)

ACCT 215	Legal Environment of Business	3
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### Electives: (24-30)

Take additional "free" electives to fulfill the minimum graduation requirement of 120 credits.

### Business Core: (27)

ACCT 285	Managerial Accounting	3
ENTSP 310	Entrepreneurship and Innovation	3
FIN 301	Principles of Finance	3
MGMT 371	Organizational Behavior	3
MGMT 372	Ethical and Responsible Management	3
MIS 301	Management Information Systems	3
MKT 340	Principles of Marketing	3
SCM 301	Supply Chain Management	3

Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in:

MGMT 478	Strategic Management ^	3
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BBA Major Courses: (21)

Required Courses (9 credits):

MIS 340	Project Management	3
MGMT 422	Negotiation and Conflict Resolution	3
MGMT 471	Introduction to Human Resource Management	3

Elective Courses (12 credits):

Choose ONE from each pairing		
SCM 424	Process Management, Analysis, and Improvement	3
or SCM 461	Principles of Transportation	
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ACCT 383	Intermediate Managerial Accounting	3
or FIN 330	Financial Markets and Institutions	
or FIN 371	Real Estate Principles	
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MGMT 414	International Management	3
or MGMT 472	Diversity, Equity, and Inclusion in Organizations	
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MKT 342	Foundation Of Personal Selling	3
or MKT 447	Consumer Behavior	

- \* Transfer coursework may be a substitute for STAT 226 Introduction to Business Statistics I, if approved.
- ^ Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

BBA students cannot double major or earn a double degree in a business area. However, they may work towards a double degree in another college at Iowa State. Online minors outside the Ivy College of Business could be added to the BBA if desired. Consult with an advisor in the Undergraduate Programs Office for assistance in identifying online minor options.

Graduate Programs

The Ivy College of Business offers a professional graduate degree program in business administration, the master of business administration (MBA) which is described below. The college also has seven specialized master degree programs: the master of accounting (MAcc), the master of business analytics (MBAN), the master of entrepreneurship (MEP), the master of finance (MFIN), the master in healthcare analytics and operations (MHAO), the master of real estate development (MRED), and the master of science in information systems (MSIS). The college also offers a PhD in business and technology, with specializations in entrepreneurship, finance, information systems, management, marketing, and supply chain management. Finally, the Ivy College of Business is a participating member of the following

interdepartmental programs: master of science in cybersecurity, master of engineering management, master of science and PhD in human computer interaction, master of science in seed technology and business, and master of science in transportation.

Master of Business Administration (MBA)

The Ivy College of Business offers a 48-credit program leading to a non-thesis master of business administration degree with a specialization in accounting, accounting analytics, business analytics, entrepreneurship, finance, healthcare analytics and operations, information systems, leadership, marketing, real estate, or supply chain management. The coursework is designed to provide the knowledge, skills, and abilities for managerial success and leadership in organizations. The MBA is the professional management education program for those pursuing careers in business.

Students may enroll in the MBA on either a full-time or part-time basis. The part-time MBA is designed for employed professionals. Part-time MBA core classes are hybrid or fully online, offering a combination of online and face-to-face instruction held in the evenings in downtown Des Moines. MBA electives may be delivered online, hybrid or in-person in Ames or Des Moines.

Students working toward the MBA are required to complete a series of core courses in the basic functional areas of business (accounting, economics, quantitative analysis, finance, supply chain management, organizational behavior, management information systems, marketing, professional responsibilities, and strategic management), as well as advanced elective coursework. Two courses on professional skills development are also required for full-time MBA students.

Courses for the MBA are provided by the departments of Accounting, Economics, Finance, Management and Entrepreneurship, Marketing, Supply Chain Management, and Information Systems and Business Analytics. Courses from other departments may also be chosen to meet specific student interests.

A concurrent BS/MBA is available to eligible engineering undergraduate students majoring in aerospace, agricultural, biological systems, chemical, civil, computer, construction, cybersecurity, electrical, industrial, materials science, mechanical, or software engineering. A concurrent BS/MBA is available to eligible undergraduate students majoring in agricultural systems technology, agronomy, animal science, chemistry, computer science, food science, geology, industrial design, industrial technology, and meteorology.

MBA Graduate Certificates

The Ivy College of Business currently has six graduate certificate programs, including:

- Business Analytics
- Digital Marketplace Analytics
- Enterprise Cybersecurity Management
- Entrepreneurship and Innovation
- Finance
- Supply Chain Management

Most certificates require 12 credits (digital marketplace analytics requires 15 credits)—with approval of the director of graduate education (DOGE), all 12-15 credits may apply towards a future Ivy graduate program.

Certificates may be earned before, after, or concurrently with a master's or doctoral degree. Credit from a previously-earned master's or doctoral degree from Iowa State University cannot be applied toward a future Ivy certificate.

For more information on any of the graduate certificates offered, please visit: <https://www.ivybusiness.iastate.edu/degree/zgraduate-certificates/>

Double master's degree programs are offered with accounting (MBA/MAcc), architecture (MBA/MArch), business analytics (MBA/MBAN), community and regional planning (MBA/MCRP), entrepreneurship (MBA/MEP), finance (MBA/MFIN), healthcare analytics and operations (MBA/MHAO), information systems (MBA/MSIS), and real estate development (MBA/MRED). A double degree program (DVM/MBA) is also available to eligible Veterinary Medicine students.

The MBA program is open to all individuals with a baccalaureate degree. Undergraduates from arts and humanities, science, and technical programs are especially encouraged to apply. Academic potential and promise for a productive career in business and for managerial success and leadership in organizations are important criteria for admission. Applicants must submit official transcripts of previous academic work, Graduate Management Admission Test (GMAT) scores or Graduate Record Exam (GRE) scores, personal essays, a resume, and two letters of reference. Students whose native language is not English and who did not graduate from a U.S. college or university are required to submit the Test of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) scores.

Applicants are considered for fall semester entry only into the full-time MBA. Although applications will be considered after this date, candidates are encouraged to submit their application materials by June 15. Part-time MBA applications are considered for fall, spring, or summer entry.

## Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams

3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program in any of the areas of specialization listed above, please visit: <https://ivybusiness.iastate.edu/degree/mba/>

## Executive Masters in Business Administration (EMBA)

The EMBA program is for professionals in the food, agriculture, and biosystems industry. The curriculum is a 48-credit program leading to a non-thesis master of business administration degree. The customized content is delivered 80% in-person, and 20% online.

## Student Learning Outcomes

Upon graduation, executive MBA (EMBA) students will:

1. Be effective leaders
2. Be effective collaborators
3. Be critical thinkers in food, agriculture, and biosystems
4. Recognize ethical and global responsibilities around food, agriculture, and biosystems

For more information on the EMBA program, please visit: <http://www.ivybusiness.iastate.edu/degree/emba/>

## Ph.D. in Business and Technology

The doctoral program at the Ivy College of Business is a full-time, residential program that prepares individuals to conduct and publish scholarly research in top journals. Graduates compete for academic positions at leading research universities in the United States and abroad. There are six specializations: entrepreneurship, finance, management information systems, management, marketing, and supply chain management.

Admission to the program is highly selective, with up to 12 students admitted annually. Applications are evaluated based on academic merit, compatibility of interests, and research ability. A master's degree is not required, but students without a sufficient business background and basic knowledge of statistics will take extra courses.

This 74-credit program requires a minimum of four years to complete.

Coursework in the first two years includes seminars in content areas, statistics and research methodology. After passing comprehensive exams, students focus on their dissertation. All work, including the dissertation, must be done in residence (on campus). In addition to coursework, students participate in research seminars, work on research projects with faculty, and attend academic conferences.

The doctoral specialization in entrepreneurship (ENTSP) prepares students to conduct and publish scholarly research in entrepreneurship, including focus on new business ventures, entrepreneurs, innovation,



and technology. In addition to curriculum in these core areas, students will also take courses in research methods and the closely-related areas of management, including strategy, organizational behavior, and human resources.

The goal of this program is to prepare students to compete for tenure-track positions at leading research universities in the United States and abroad. As a doctoral candidate, students will learn how to conduct impactful research, and they are expected to develop a research pipeline and publish their work in top academic journals before entering the job market.

The finance (FIN) specialization trains students to teach at the university level, to do research that is publishable in top academic journals, and to analyze questions that are important to government agencies and the private sector. Successful students develop close working relationships with the ISU finance faculty, both in the classroom and on co-authored research. We strive for our students to publish their first research study before finishing the program, and to obtain jobs at universities rated "high" or "very high" in research activity by the Carnegie Foundation. We emphasize rigorous training and hands-on experience. Five semesters of coursework include a firm grounding in economic theory, thorough training in statistics and econometrics, and an immersion in the most important research studies in corporate finance, investments, and financial institutions.

The management information systems (MIS) specialization examines issues related to the development, building, management, and use of information and knowledge-based technologies. Such technologies enable users to collect organizational data, provide a platform for organizing and disseminating the data, and offer operational, decision support, and knowledge management tools through which users can leverage data and information for making better organizational decisions. Students in the IS specialization will study areas such as information technology analysis and development, database and knowledge management systems, decision support and data mining, human computer interaction, system security and integrity, and project management and collaborative teamwork.

The management (MGMT) specialization applies a broad range of theoretical perspectives from the social sciences and diverse research methods to the study of organizational behavior, human resources, strategy, and entrepreneurship. The curriculum takes a multidisciplinary approach to analyze individuals and teams, the formulation and implementation of strategy, the effective use of human resources, social responsibility and ethics, entrepreneurship, innovation and technology, and the challenges of the global business environment. The program emphasizes personalized attention and the development of scholars who can contribute with high-quality theoretical and empirical research in these and related areas.

The marketing (MKT) area focuses on identification and delivery of solutions that help improve the ways in which businesses attract, capture, service and maintain customers. To do these activities well, organizations will need to integrate process goals and activities across different functional areas and across multiple organizational partners. This area of study will examine issues relating to inter-functional and inter-organizational relationships and their management in pursuit of maximizing the lifetime value of a businesses' customer base.

The supply chain management (SCM) specialization focuses on the design, development, and control of business processes for conversion of inputs into outputs and distribution of those outputs. The traditional focus of SCM was on integration of processes across multiple functions within the firm—operations management, logistics, and purchasing primarily, with elements of marketing and information systems included as well. However, in today's world, where competition occurs across supply chain networks, SCM also involves integrating business processes across firms.

Programs of study for the doctoral study are designed for each student in consultation with the major professor and the student's PhD committee. Each student must complete advanced courses in his/her area of specialization, a minor area that supports the major area, and research methods courses. Students must demonstrate competence in theory and research methods by passing qualifying examinations.

The final application deadline for the PhD program is January 15 for fall admission. Applicants must submit official transcripts of previous coursework and degrees, Graduate Management Admission Test (GMAT) scores or Graduate Record Exam (GRE) scores, personal essays, a resume, and three letters of reference. International students whose native language is not English and who did not graduate from a U.S. college or university are required to submit TOEFL (Test of English as a Foreign Language) scores.

## Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program in any of the areas of specialization listed above, please visit: <https://ivybusiness.iastate.edu/phd/>

## Graduate Minor in Business Administration

The Ivy College of Business also offers a business administration minor to students with majors outside the college. In order to obtain a graduate minor in business administration at Iowa State University, a student must complete eighteen credit hours of the required core courses for the major

in business administration. A student who wishes to minor in business administration must have full admission status in his/her respective graduate program and must be in good academic standing (graduate transcript required).

Required Courses (9 credits):

ACCT 501	Financial Accounting	3
MGMT 502	Organizational Behavior	3
MGMT 503	Professional Responsibility in Business and Society	3

Choose THREE additional courses from the list below (9 credits):

FIN 501	Financial Valuation and Corporate Financial Decisions	3
MKT 501	Marketing	3
SCM 501	Supply Chain Management	3
MIS 501	Management Information Systems	3

Applications for the graduate minor in business administration are accepted for fall semester entry only.

For more information on the graduate minor in business administration, please visit: <https://ivybusiness.iastate.edu/degree/zgraduate-minors/>

## Business Analytics

We live in a day where we are overwhelmed with data. Today's companies are data-rich and information-poor (DRIP). Business analytics is the transformation of data into insights for better decision making. This transformation is iterative and multi-disciplinary. Business analytics falls at the intersection of technology, statistics, and business.

Students studying business analytics will gain the knowledge and skills necessary to understand and apply quantitative modeling techniques, design cross-functional solutions using standard and advanced business analytics technologies and software, evaluate data mining methods, communicate solutions using data visualizations, develop team and project management skills in a big data context, and effectively communicate analytical findings both orally and in writing.

### Undergraduate Major in Business Analytics

**For undergraduate curriculum in business, major in Business Analytics.**

The Department of Information Systems and Business Analytics offers a major in Business Analytics. Students will complete the general education requirements (including business foundation courses), business core requirements for the bachelor of science (B.S.) degree, and 21 additional credits in the major.

The instructional objective of the business analytics major is to prepare students to realize the opportunities presented by data. This

includes bringing structure to data, finding compelling patterns in data, communicating the stories buried in data, and advising decision-makers at all levels on the implications for processes and decisions through a data-driven approach.

For more information on the undergraduate major in Business Analytics, please visit: <https://ivybusiness.iastate.edu/degree/business-a/>

### Student Learning Outcomes

Upon graduation, undergraduate students majoring in Business Analytics will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Degree Requirements

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>), Business Analytics majors must also complete:

Required Courses (12 credits):

DS 201	Introduction to Data Science	3
MIS 320	Database Management Systems *	3
or ACCT 384	Accounting Information Systems and Analytics	
MIS 436	Introduction to Business Analytics #	3
MIS 446	Advanced Business Analytics #	3

Elective Courses (9 credits):

Select three courses from the following list:

ACCT 484	Advanced Accounting Information Systems	3
FIN 426X	Quantitative Investment Analysis	3
FIN 450	Analytical Methods in Finance	3
MGMT 473	Evidence-Based Decision Making in Human Resource Management	3
MIS 307	Intermediate Business Programming	3
MIS 315	Business Data Streams and Issues	3
MIS 368	Marketing Analytics	3
MIS 410X	Blockchain and Cryptocurrency	3
MIS 441X	Cybersecurity Analytics	3
MKT 361	Social Media Marketing Strategy	3
MKT 367	Consultative Problem Solving	3
MKT 445	Customer Relationship Management	3
SCM 430	Supply Chain Analytics	3

SCM 460	Decision Tools for Logistics and Operations Management	3
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\* If both MIS 320 and ACCT 384 are taken, one will count for 3 elective credits in the major.

# STAT 326 is a prerequisite for these courses.

NOTE: Business Analytics majors must take STAT 326 Introduction to Business Statistics II as part of the supporting courses.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Business Analytics, B.S.

*Sample 4-Year Plan (Your plan may differ)*

#### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 PHIL 230	3
ENGL 150	3 ACCT 284	3
MATH 150	3 Global/International Perspective <sup>@</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 MIS 301	3
ACCT 301 (1 cr if taking ACCT 384)	STAT 326	3
DS 201	3 SP CM 312	3
MATH 151	3 Natural Science	3
ENGL 250	3 Business Core Course	3
HUM SOC/SCI	3	
	<b>15</b>	<b>15</b>

#### Junior

Fall	Credits Spring	Credits
MIS 320 or ACCT 384	3 MIS 436	3

Business Core Courses	6 Business Core Courses	6
ACCT 215	3 Global/International Perspective <sup>@</sup>	3
US Diversity <sup>#</sup>	3 ENGL 302	3
General Electives (only 1 cr if ACCT 301 taken)	2	
	<b>17</b>	<b>15</b>

#### Senior

Fall	Credits Spring	Credits
MIS 446	3 Business Analytics Elective	3
Business Core Course	3 MGMT 478 <sup>*</sup>	3
Business Analytics Electives	6 General Electives	9
HUM/SOC SCI	3	
	<b>15</b>	<b>15</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

#### Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

### Undergraduate Minor in Business Analytics

The Department of Information Systems and Business Analytics also offers a minor for non-Business Analytics majors in the Ivy College

of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least nine credits that are not used to satisfy any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

#### Required Courses (9 credits):

DS 201	Introduction to Data Science	3
MIS 320	Database Management Systems *	3
or ACCT 384	Accounting Information Systems and Analytics	
MIS 436	Introduction to Business Analytics #	3

#### Elective Courses (6 credits):

Choose at least two 3-credit courses from the list below		
ACCT 484	Advanced Accounting Information Systems	3
FIN 426X	Quantitative Investment Analysis	3
FIN 450	Analytical Methods in Finance	3
MGMT 473	Evidence-Based Decision Making in Human Resource Management	3
MIS 307	Intermediate Business Programming	3
MIS 315	Business Data Streams and Issues	3
MIS 410X	Blockchain and Cryptocurrency	3
MIS 441X	Cybersecurity Analytics	3
MIS 446	Advanced Business Analytics #	3
MIS 368	Marketing Analytics	3
MKT 361	Social Media Marketing Strategy	3
MKT 367	Consultative Problem Solving	3
MKT 445	Customer Relationship Management	3
SCM 430	Supply Chain Analytics	3
SCM 460	Decision Tools for Logistics and Operations Management	3

\* If both MIS 320 and ACCT 384 are taken, one will count for 3 elective credits in the minor.

# STAT 326 is a prerequisite for these courses.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent

courses listed in the course catalog and count as elective choices in the major.

For more information on the undergraduate minor in Business Analytics, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Concurrent Degrees

The Department of Information Systems and Business Analytics offers three concurrent degree programs that allow qualified students to be admitted to the following Masters programs while completing their undergraduate degree. Students can double count up to 6 credits of coursework between the degrees, allowing them to complete both a Bachelors and a Master's degree in as little as five years. The concurrent degree programs offered include:

- B.S. Business Analytics (BUSAN) and Master of Business Analytics (MBAN)
- B.S. Business Analytics (BUSAN) and Master of Science in Information Systems (MSIS)
- B.S. Management Information Systems (MIS) and Master of Business Analytics (MBAN)

For more information on any of the concurrent programs listed above, please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## Graduate Programs

### Master of Business Analytics (MBAN)

The master of business analytics (MBAN) is an interdisciplinary program that addresses the challenges of dealing with data analytics and business intelligence in the "Big Data" environment. The goal is to develop managers who will master analytics in ways that lead to increased profits for their company. This blended program offers both online and face-to-face education in a comprehensive approach that draws from Business, Computer Science, Electrical and Computer Engineering, Statistics, and Industrial and Manufacturing Systems Engineering. It provides a foundation in data analytics project management, statistical and predictive modeling, consumer sentiment analysis, knowledge discovery, analytical reporting, segmentation analysis and data visualization. The program requires 30 credits of graduate level courses over a 21 month period. Students start the program with a one-week on-campus initiation class. Students then revisit campus once during the middle and once at the end of the program, while taking online classes during the rest of the time.

### Student Learning Outcomes

Upon graduation, master of business analytics (MBAN) students will:

1. Be analytics modelers
2. Be problem solvers in analytics

3. Be evaluators of analytics
4. Be critical thinkers in analytics
5. Be collaborators in big data and analytics
6. Be effective communicators

For more information about the Master of Business Analytics program, please visit: <https://ivybusiness.iastate.edu/degree/mban/>

## **Masters in Healthcare Analytics and Operations (MHAO)**

Students graduating from the Masters in Healthcare Analytics and Operations program will apply data and appropriate models to analyze operations and supply chains to develop and present actionable insights leading to better outcomes in the healthcare industry. Healthcare analytics uses historical and current data to predict trends and optimize operations, bringing benefits to patients, medical professionals, and healthcare supply chain partners.

For more information about the Master of Healthcare Analytics and Operations program, please visit: <https://www.ivybusiness.iastate.edu/degree/master-of-healthcare-analytics-and-operations/>

## **Double Graduate Degrees**

The Department of Information Systems and Business Analytics participates in two double degree programs at the graduate level.

Students can simultaneously pursue a double degree in Master of Business Administration (MBA) and Master of Business Analytics (MBAN) or the Master of Business Administration (MBA) and Master of Healthcare Analytics and Operations (MHAO). The Double Degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on either double degree offered, please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## **Master of Business Administration (MBA)**

The Department of Information Systems and Business Analytics participates in the full-time and part-time Master of Business Administration (MBA) program. The MBA is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students may develop an area of specialization in Business Analytics or Healthcare Analytics and Operations.

## **Student Learning Outcomes**

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Business Analytics or Healthcare Analytics and Operations, please visit: <https://ivybusiness.iastate.edu/degree/mba/>

## **Graduate Certificates**

### **Business Analytics**

The graduate certificate in business analytics will address the challenges of dealing with issues of "big data" and its analysis to extract actionable insights, equips business professionals with the basic analytic concepts and techniques necessary in various areas of business such as marketing, supply chain, operations, forensics, and risk management. Students will have a foundation in data management, business analytics, modeling, and communicating through data visualization.

The certificate is for working professionals as well as students enrolled in graduate programs who are employed or seeking a career as business analysts, analytic systems designers, and data scientists to help improve business performance. The certificate is available online, on campus in Ames and at Capital Square in Des Moines.

For more information about the graduate certificate in business analytics, please visit: <https://ivybusiness.iastate.edu/ba-certificate/>

### **Digital Marketplace Analytics**

A graduate certificate in digital marketplace analytics is jointly offered by the Ivy College of Business and the College of Human Sciences. The 15-credit certificate, which incorporates coursework from both colleges, provides an innovative program for individuals who want to build their data analytics skills and to apply analytics tools to problem-solving in the fashion, events, and hospitality industries.

For more information about the graduate certificate in digital marketplace analytics, please visit: <https://ivybusiness.iastate.edu/dma-graduate-certificate/> (<https://www.ivybusiness.iastate.edu/dma-graduate-certificate/>)

## **Business Economics**

The Ivy College of Business has partnered with the Department of Economics to offer a Business Economics major.

Where business studies the organizations and functions that deliver goods and services to customers, economics studies those good and services with respect to production, distribution, and consumption, and the choices we make about how to best utilize the resources we have.

## **Undergraduate Major in Business Economics**

**For undergraduate curriculum in business, major in business economics.**

Through a partnership between the Ivy College of Business and the Department of Economics, a major in Business Economics is offered. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites,

business core requirements for the bachelor of science (BS) degree, and 19 additional credits in the major.

The objective of the Business Economics major is to provide a high quality education with a balanced emphasis in both business and economics. Such an education should equip graduates with a unique set of skills distinguishing them from other graduates. In particular, they will have the ability to use both business and economic reasoning to think critically and address complex issues using tools and decision making models of economics, business, mathematics, statistics, as well as concepts from the biological, physical, and social sciences; to make decisions and to communicate effectively.

For more information on the undergraduate major in Business Economics, please visit: <https://www.ivybusiness.iastate.edu/degree/business-economics/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Business Economics will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), business economics majors must also complete:

Required Courses (10 credits):

ECON 301	Intermediate Microeconomics	4
ECON 353	Money, Banking, and Financial Institutions	3
ECON 431	Managerial Economics	3
ECON 492	Graduating Senior Survey	R

Elective Courses (9 credits):

Select one course of ECON 230-289, 300-389, or 400-489	3
Select two additional 400-489 level ECON courses	6

NOTES:

Business Economic majors must take STAT 326 Introduction to Business Statistics II as part of the supporting courses.

Business Economic majors take MATH 160 and ECON 207 instead of MATH 150 and MATH 151.

Students majoring in business economics are not permitted to take agricultural business or economics as a double major, or economics as a minor.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Business Economics, B.S.

*Sample 4-Year Plan (Your plan may differ)*

### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ACCT 284	3
ECON 101	3 STAT 226	3
COM S 113	3 ENGL 250	3
ENGL 150	3 ECON 102	3
MATH 160	4 HUM/SOC SCI	3
LIB 160	1 BUSAD 203	1
	<b>15</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ECON 207	3 PHIL 230	3
SP CM 312	3 STAT 326	3
ACCT 285	3 Business Core Course	3
Business Core Course	3 ECON 301	4
Natural Science	3 Global/International Perspective <sup>@</sup>	3
	<b>15</b>	<b>16</b>

### Junior

Fall	Credits Spring	Credits
ACCT 215	3 ECON Elective (200+ level or above)	3
ECON 353	3 ECON Elective (400-level)	3
Business Core Courses	6 Business Core Courses	6
General Elective	3 US Diversity <sup>#</sup>	3
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
ECON 431	3 ECON 492	R
ENGL 302	3 ECON Elective (400-level)	3
HUM/SOC SCI	3 HUM/SOC SCI	3
Global/International Perspective <sup>@</sup>	3 MGMT 478 <sup>*</sup>	3



Business Core Course	3 General Electives	6
	<b>15</b>	<b>15</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

**Graduation Requirements:**

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Entrepreneurship

Success in entrepreneurship requires a broad base of conceptual knowledge, personal skills, and competencies. By majoring in entrepreneurship, you will sharpen your creative thinking and problem-solving skills, develop your entrepreneurial mindset to start your own business, develop a new product, or become an innovator in an established company. The required courses in the major provide a variety of rich developmental experiences that include applied learning, case analysis, research projects, team-based learning, and guest speakers, in addition to traditional classroom lectures and discussions. The Entrepreneurship major places a strong emphasis on written and oral communication skills, teamwork, creativity, leadership, and personal initiative.

### Undergraduate Major in Entrepreneurship

For undergraduate curriculum in business, major in entrepreneurship.

The Department of Management and Entrepreneurship offers a major in Entrepreneurship. Students will complete the general education requirements (including business foundation courses), business core requirements for the Bachelor of Science (B.S.) degree, and 18 additional credits in the major.

The Entrepreneurship major is designed to prepare students for the field of entrepreneurship. Upon graduation, students will be prepared to identify and exploit business opportunities, start their own business, or lead venture-creation and innovative initiatives at established for-profit and non-profit organizations.

The Entrepreneurship Major rests on three pillars:

- **Business Startup and Small Business Management.** The major focuses on starting and managing new and small businesses, including family businesses, which present different challenges that require knowledge of various models of leadership, market research, fundraising, risk management, and other activities with increasingly digital components.
- **Corporate Entrepreneurship, Innovation, and Technology Management.** Today's highly sought-after employees are those with entrepreneurial mind and skill sets that allow them to create, lead, and contribute to innovative projects and initiatives within their organizations. Thus, this major prepares students for leadership positions at established innovative firms.
- **Social Entrepreneurship.** A major emphasis is given to managing non-profit ventures to initiate and support positive social and environmental changes. Entrepreneurship principles and tools have proven their relevance and value for both small and large non-profit ventures and organizations. Thus, this major prepares students who are interested in making a difference by supporting positive social and environmental causes.

The Entrepreneurship Major includes a wide range of opportunities for experiential learning through elective courses and offers a variety of robust extracurricular activities through collaboration with the Pappajohn Center for Entrepreneurship. Entrepreneurship is also an attractive second major for students with interests in any other business field.

Students majoring in Entrepreneurship are not permitted to take Entrepreneurship as a minor.

For more information on the undergraduate major in Entrepreneurship, please visit: <https://ivybusiness.iastate.edu/degree/entrepreneurship/>

### Student Learning Outcomes

Upon graduation, undergraduate students majoring in Entrepreneurship will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), Entrepreneurship majors are required to complete 18 credit hours of entrepreneurship or management department-approved courses.

Included in these 18 credits are four required courses:

Required Courses (12 credits):

ENTSP 313	Feasibility Analysis for New Ventures	3
ENTSP 320	Corporate Entrepreneurship	3
ENTSP 410	Social Entrepreneurship	3
ENTSP 480	Applied Entrepreneurship: Executing New Ventures	3

Elective Courses (6 credits):

Select two courses from the following list:

ENTSP 367	International Entrepreneurship	3
ENTSP 381	Managing Family Businesses	3
ENTSP 461	Entrepreneurship and Accounting Information	3
ENTSP 431	Small Business Finance Decisions	3
ENTSP 454	Entrepreneurial Marketing	3
MGMT 471	Introduction to Human Resource Management	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
ACCT 383	Intermediate Managerial Accounting	3
ACCT 416	Business Law	3
FIN 310	Corporate Finance	3
FIN 435	Venture Capital, Private Equity, and Mergers and Acquisitions	3
MIS 340	Project Management	3
MKT 342	Foundation Of Personal Selling	3
MKT 361	Social Media Marketing Strategy	3
MKT 362	Digital Marketing	3
MKT 363X	Creative Tools for Digital Marketing	3
MKT 447	Consumer Behavior	3
SCM 424	Process Management, Analysis, and Improvement	3
SCM 466	Global Trade Management	3
SCM 495	Executive Analysis and Presentations	3
AESHM 474	Entrepreneurship in Human Sciences	3
AESHM 476CX	Entrepreneurship Studio: Creating an Online Business	3

DES 230	Design Thinking <sup>^</sup>	3
DSN S 340	Design Entrepreneurship	3
ECON 234	Small Business Management <sup>^</sup>	3
ECON 334	Entrepreneurship in Agriculture	3
ENGR 430	Entrepreneurial Product Engineering	3
LD ST 370	Special Topics <sup>*</sup>	3

<sup>^</sup> 42 credits of 300-level or higher coursework from a four-year institution is required to graduate. Students choosing 200-level courses toward their major may be required to compensate for this requirement elsewhere in their curriculum.

<sup>\*</sup> Only sections of LD ST 370 with a topic of "Leadership, Entrepreneurship, and Innovation" may count as an elective for the major. Additionally, only 3 credits of LD ST 370 may count towards the entrepreneurship major electives.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Entrepreneurship, B.S.

*Sample 4-Year Plan (Your plan may differ)*

### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 US Diversity <sup>#</sup>	3
ENGL 150	3 ACCT 284	3
MATH 150	3 ENGL 250 <sup>^</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 PHIL 230	3
SP CM 312	3 ACCT 215	3
ENTSP 310	3 MGMT 371	3
Natural Science	3 Global/International Perspective <sup>@</sup>	3

MATH 151	3 HUM/SOC SCI	3
	15	15
Junior		
Fall	Credits Spring	Credits
ENTSP 313	3 ENTSP 320	3
Business Core Courses	6 ENTSP 410	3
General Electives	6 Business Core Courses	6
	HUM/SOC SCI	3
	15	15
Senior		
Fall	Credits Spring	Credits
ENTSP 480	3 MGMT 478*	3
ENTSP Elective	3 ENTSP Elective	3
Global/International Perspective@	3 HUM/SOC SCI	3
ENGL 302	3 General Electives	6
Business Core Course	3	
General Elective	2	
	17	15

Total Credits: 122

@ Courses in these requirements may also be used as Global Perspective.

^ Students are encouraged to register for sections of ENGL 250 that have topics focused on entrepreneurship and innovation.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.

8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

Undergraduate Minor in Entrepreneurship

An Entrepreneurship minor for non-Entrepreneurship majors is also available. This university-wide undergraduate minor in Entrepreneurship is available to all undergraduate students at Iowa State University. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include 9 credits that are not used to meet any other department, college, or university requirement. Students must follow college-specific rules in selecting courses for the minor. The college representatives to the supervisory committee for the minor will be responsible for advising students in their college, and will inform students about the details of the college rules. Students with declared majors have priority over students with declared minors in courses with space constraints.

Non-business students with an Entrepreneurship minor are not permitted to major in Entrepreneurship. Business students interested in Entrepreneurship may choose to major in Entrepreneurship (<https://catalog.iastate.edu/collegeofbusiness/entrepreneurship/#undergraduatemajortext>), or pursue the Entrepreneurship minor.

A student seeking a minor in entrepreneurship must successfully complete a minimum of 15 credits in courses approved for use in the entrepreneurship program, including the following:

Required Courses (6 credits):

ENTSP 310	Entrepreneurship and Innovation	3
ENTSP 313	Feasibility Analysis for New Ventures	3
	or ENTSP 320 Corporate Entrepreneurship	
	or ENTSP 410 Social Entrepreneurship	

ENTSP 310 Entrepreneurship and Innovation is the introductory course and provides an overview of the entire field.

ENTSP 313 Feasibility Analysis for New Ventures emphasizes developing an idea for a new venture, conducting a feasibility study, researching the potential market, analyzing the competition, and preparing a formal business plan.

ENTSP 320 Corporate Entrepreneurship introduces and examines state-of-the-art approaches to product innovation and technology development in today's large and established organizations.

ENTSP 410 Social Entrepreneurship discusses issues related to the role of social entrepreneurship in helping to solve social problems, including

innovation, opportunity recognition, planning and the launch of new non-profit organizations.

#### Elective Courses (6 credits):

Select TWO entrepreneurship-oriented electives from an approved course list (see below). Students are encouraged to take electives within their major college.

#### Experiential Learning (3 credits):

Students will engage in the process(es) of entrepreneurship to earn experiential learning credits. Students will either take a course that has been designated as an experiential learning course, or use some other experiential learning activity as the basis to receive credits through an independent study.

Detailed information about the Entrepreneurship minor, the list of approved electives, as well as information about the experiential learning options are available online at: <https://ivybusiness.iastate.edu/entrepreneurship-minor/>

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Entrepreneurship, please visit: <https://catalog.iastate.edu/interdisciplinaryprograms/minor/entrepreneurship/#undergraduateminortext>

## Graduate Programs

### Master of Entrepreneurship (MEP)

The Department of Management and Entrepreneurship offers a Master of Entrepreneurship (MEP) degree intended to convey entrepreneurial expertise that prepares graduates to launch successful startups and international ventures. The MEP is a non-thesis degree offering students the opportunity to develop strong conceptual and practical entrepreneurial skills. With a flexible curriculum covering a broad range of entrepreneurial topics and immersion in practically-oriented experiential activities, the 30-credit hour program is built with aspirant entrepreneurs in mind. With both online and in-person course offerings and extensive list of elective and experiential credits to choose from, this program is designed to provide an educational experience tailored to your needs. With a focus on imparting advanced skills related to developing business ideas to start a new venture, taking an existing startup to the next level, and advancing innovation strategies in existing organizations, graduates will be prepared to be successful entrepreneurs in a variety of contexts.

### Student Learning Outcomes

Upon graduation, MEP students will be able to:

1. Identify and explore entrepreneurial opportunities
2. Develop and test business ideas
3. Identify and secure key stakeholder relationships
4. Strategically position and launch new ventures
5. Design and implement strategic plans, processes and systems for innovation
6. Identify and access resources for launching a startup

For more information about the MEP program, please visit: <https://www.ivybusiness.iastate.edu/degree/master-of-entrepreneurship> (<https://www.ivybusiness.iastate.edu/degree/master-of-entrepreneurship/>)

### Double Graduate Degree

The Department of Management and Entrepreneurship participates in one double degree program at the graduate level. Students can simultaneously pursue a double degree in Master of Business Administration (MBA) and Master of Entrepreneurship (MEP). The double degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on the double degree in Master of Business Administration (MBA) and Master of Entrepreneurship (MEP), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

The Department of Management and Entrepreneurship participates in the full-time and part-time Master of Business Administration (MBA) and in the PhD in Business and Technology programs.

### Master of Business Administration (MBA)

The MBA is a 48-credit, non-thesis, non-creative component curriculum.

Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students can obtain a specialization in entrepreneurship.

### Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in entrepreneurship, please visit: <https://www.ivybusiness.iastate.edu/mba-full-time-details/>

### Ph.D. in Business and Technology

The doctoral specialization in entrepreneurship (ENTSP) prepares students to conduct and publish scholarly research in entrepreneurship, including focus on new business ventures, entrepreneurs, innovation,

and technology. In addition to curriculum in these core areas, students will also take courses in research methods and the closely-related areas of management, including strategy, organizational behavior, and human resources.

The goal of this program is to prepare students to compete for tenure-track positions at leading research universities in the United States and abroad. As a doctoral candidate, students will learn how to conduct impactful research, and they are expected to develop a research pipeline and publish their work in top academic journals before entering the job market.

Student Learning Outcomes

Upon graduation, PhD students will be able to:

- 1. Understand and advance knowledge
- 2. Create knowledge through original research
- 3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Entrepreneurship, please visit: <https://ivybusiness.iastate.edu/degree/phd/phd-entrepreneurship-and-management/>

Graduate Certificate

A graduate certificate in Entrepreneurship and Innovation offers post-undergraduate students the opportunity to learn the basics of starting a business. The certificate requires 4 courses (12 credits). The two required core courses are offered online by the Ivy College of Business. Elective courses are available across campus.

The graduate certificate in Entrepreneurship and Innovation focuses on strategies and resources for launching new ventures and helps students understand the role of innovation in entrepreneurship.

This interdisciplinary certificate provides a solid foundation in entrepreneurship and innovation through required core courses ENTSP 566 Entrepreneurship and New Venture Startup and ENTSP 583 Formulating and Implementing Innovation Strategies. At the same time, the program enables students to follow their own interests through electives offered by partners across campus.

For more information about the graduate certificate in Entrepreneurship and Innovation, please visit: <https://ivybusiness.iastate.edu/ei-certificate/>

Finance

Finance is a broad program of study designed to prepare students to make reasoned and empirically motivated financial decisions. Finance is also an excellent area for those who wish to become more knowledgeable

consumers, particularly in the fields of investments, insurance, and real estate.

The study of finance encompasses corporate financial management, investment management, financial analytics, banking, insurance, and real estate. Upper-level courses include case studies, a student-managed investment portfolio, and opportunities to apply foundational skills from earlier courses into specific real-world investment and corporate settings.

Undergraduate Major in Finance

For undergraduate curriculum in business, major in finance.

The Department of Finance offers a major in finance. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (B.S.) degree, and 21 additional credits in the major.

The instructional objective of the Finance program is to provide a well-rounded professional education in finance. Such an education should provide the student with:

- 1. a mastery of basic financial concepts and methods of analysis
- 2. an understanding of financial operations in a global setting and of the role of financial institutions in the economy
- 3. an ability to effectively communicate and work with others as the finance member of a team
- 4. an ability to demonstrate leadership capabilities in financial analysis and portfolio management.

For more information on the undergraduate major in Finance, please visit: <https://ivybusiness.iastate.edu/degree/finance/>

Student Learning Outcomes

Upon graduation, undergraduate students majoring in Finance will:

- 1. Be effective communicators
- 2. Be effective collaborators
- 3. Be problem solvers
- 4. Understand business concepts
- 5. Recognize ethical and legal responsibilities to organizations

Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>), finance majors must also complete:

Required Courses (6 credits):

FIN 310	Corporate Finance	3
FIN 320	Investments	3

## Elective Courses (15 credits):

Select five courses from the following (at least three must be 400-level or above): \*

FIN 330	Financial Markets and Institutions	3
FIN 334X	Introduction to Financial Technologies and Cryptocurrencies	3
FIN 361	Personal Risk Management and Insurance	3
FIN 371	Real Estate Principles	3
FIN 410X	Corporate Financial Planning and Analysis	3
FIN 415	Business Financing Decisions	3
FIN 424	Financial Futures and Options	3
FIN 425	Security Analysis and Portfolio Management	3
FIN 426X	Quantitative Investment Analysis	3
FIN 427	Fixed Income Securities	3
FIN 428	Advanced Fixed Income Analysis and Portfolio Management	3
FIN 431	Small Business Finance Decisions	3
FIN 435	Venture Capital, Private Equity, and Mergers and Acquisitions	3
FIN 445	Bank Management Decisions	3
FIN 450	Analytical Methods in Finance	3
FIN 455	Risk Modeling	3
FIN 456	Financial Modeling	3
FIN 462	Corporate Risk Management and Insurance	3
FIN 472	Real Estate Finance	3
FIN 474	Real Estate Investment	3
FIN 480	International Finance	3
FIN 491	International Study Course in Global Capital Markets	3
FIN 492X	Case Studies in Strategic Financial Decision-Making	3

Total Credits: 21

\* You may use one of the following Accounting courses to count as a 300-level Finance course elective:

ACCT 383 Intermediate Managerial Accounting

ACCT 386 Intermediate Financial Accounting I

OR...

You may use ACSCI 401 Loss Models I to count as one of the Finance course electives.

NOTE: Finance majors must take STAT 326 Introduction to Business Statistics II as part of the supporting courses.

NOTE: Students who are completing a double major in Actuarial Science and Finance can take STAT 341 Introduction to the Theory of Probability and Statistics I in place of STAT 326 Introduction to Business Statistics II.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Finance, B.S.

*Sample 4-Year Plan (Your plan may differ)*

**Freshman**

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 US Diversity <sup>#</sup>	3
ENGL 150	3 ACCT 284	3
MATH 150	3 SP CM 312	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
ACCT 285	3 Core Business Course	3
FIN 301	3 PHIL 230	3
MATH 151	3 STAT 326	3
ENGL 250	3 HUM/SOC SCI	3
Natural Science	3 Global/International Perspective <sup>@</sup>	3
	<b>15</b>	<b>15</b>

**Junior**

Fall	Credits Spring	Credits
ACCT 215	3 FIN Electives	6
FIN 310	3 General Elective	3
FIN 320	3 Core Business Course	3
Core Business Courses	6 HUM/SOC SCI	3
	<b>15</b>	<b>15</b>



**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
FIN Electives	6 FIN Elective	3
Core Business Courses	6 MGMT 478*	3
HUM/SOC SCI	3 Global/International Perspective <sup>@</sup>	3
ENGL 302	3 General Electives	5
	<b>18</b>	<b>14</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

**Graduation Requirements:**

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree** requirements.

**Undergraduate Minor in Finance**

The Department of Finance also offers a finance minor for non-finance majors in the Ivy College of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

**Required Course (3 credits):**

FIN 301	Principles of Finance	3
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**Elective Courses (12 credits):**

Select twelve credit hours from 300 or 400 level Finance courses

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Finance, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

**Concurrent Programs**

The Department of Finance offers one concurrent degree program that allows qualified students to be admitted to the Master of Finance (MFIN) program while completing their undergraduate degree in finance. Students can double count up to 6 credits of coursework between the degrees, allowing them to complete both a B.S. in Finance and a Master's degree in as little as five years.

For more information about the concurrent B.S. in Finance and Master of Finance (MFIN) program, please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

**Graduate Programs**  
**Master of Finance (MFIN)**

The Finance Department offers a Master of Finance (MFIN) degree. The MFIN is a non-thesis, non-creative component curriculum designed to provide students with in-depth coverage of finance topics and a strong quantitative skill set. Students will learn financial analysis and valuation, advanced regression techniques and programming approaches for data analysis, time series analysis and forecasting, optimization techniques, modelling of financial and risk variables, simulation techniques, and tools for effective risk management. The 30-credit program requires 18 core credits. Another 12 credits of electives are required, six of which must be in finance courses.

**Student Learning Outcomes**

Upon graduation, master of finance (MFIN) students will:

1. Be critical thinkers in finance
2. Have a broad understanding of financial concepts
3. Have strong problem solving and decision-making skills
4. Have a strong background in ethical development

For more information about the MFIN program, please visit: <https://ivybusiness.iastate.edu/degree/mfin/>

## Master of Real Estate Development (MRED)

The Finance Department also offers a Master of Real Estate Development (MRED) degree. Jointly created with the College of Design, and with significant input and engagement from industry leaders, the MRED is a 30-credit non-thesis, non-creative component program. The MRED program offers academic training, networking opportunities and collaboration with leading academics and practitioners to solve real world problems. Areas of study include real estate market analysis, finance, investments, leadership and negotiation, fundamentals of the build environment, construction science and urban planning. The curriculum is offered in a convenient format of distance learning and brief campus residencies, making it ideal for the full-time working professional.

### Student Learning Outcomes

Upon graduation, master of real estate development (MRED) students will:

1. Be knowledgeable in various aspects of real estate
2. Be critical thinkers in real estate
3. Be innovators in real estate
4. Be leaders in real estate

For more information about the MRED program, please visit: <https://ivybusiness.iastate.edu/degree/masters-mred/>

## Double Graduate Degrees

The Finance Department participates in two double degree programs at the graduate level. Students can simultaneously pursue a double degree in Master of Finance (MFIN) and Master of Real Estate Development (MRED), or in Master of Business Administration (MBA) and Master of Real Estate Development (MRED). The double degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on the double degree in Master of Finance (MFIN) and Master of Real Estate Development (MRED), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

For more information on the double degree in Master of Business Administration (MBA) and Master of Real Estate Development (MRED), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## Master of Business Administration (MBA)

The Department of Finance also participates in the full-time and part-time Master of Business Administration (MBA) program as well as the PhD in Business and Technology program. The MBA is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students may develop an area of specialization in Finance or Real Estate.

## Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Finance or Real Estate, please visit: <https://ivybusiness.iastate.edu/mba-full-time-details/>

## Ph.D. in Business and Technology

The PhD in Business and Technology with a Finance (FIN) specialization is a 56-credit (minimum) curriculum designed to train students to teach at the university level, to do research that is publishable in top academic journals, and to analyze questions that are important to government agencies and the private sector. Successful students develop close working relationships with the ISU finance faculty, both in the classroom and on co-authored research. We strive for our students to publish their first research study before finishing the program, and to obtain jobs at research-oriented universities in the U.S. and abroad. We emphasize rigorous training and hands-on experience. Five semesters of coursework include a firm grounding in economic theory, thorough training in statistics and econometrics, and an immersion in the most important research studies in corporate finance, investments, and financial institutions.

### Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Finance, please visit: <https://ivybusiness.iastate.edu/phd/phdfinance/>

## Graduate Certificate

The graduate certificate in finance provides training in investment valuation and the skills necessary to value an entire company through analysis of expected cash flows based on financial statements, growth characteristics, and risk.

The certificate is for graduate students and recent graduates seeking job opportunities as investors or professional money managers, who deal with efficient asset allocation in a portfolio setting, investment performance measurement, and performance evaluation. The certificate is available on campus in Ames.

For more information about the graduate certificate in Finance, please visit: <https://ivybusiness.iastate.edu/finance-graduate-certificate/>

# Healthcare Management

Healthcare management is a great fit for students who want to combine their interests in both healthcare and business. The major includes instruction in planning, business management, financial management, healthcare quality management, organizational behavior and leadership, health policy, health law and regulations, and management of health information systems. As a part of the curriculum, students are required to complete an experiential learning component (internship, co-op, or an independent study).

## Undergraduate Major in Healthcare Management

**For undergraduate curriculum in business, major in healthcare management.**

The department of Management and Entrepreneurship offers a major in healthcare management. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (B.S.) degree, and 24 additional credits in the major.

The instructional objective of the Healthcare Management program is to provide a well-rounded professional education in healthcare management. Such an education should provide the student with:

- 1. **Foundational knowledge of the healthcare management field:** insurance, current healthcare policy, policy development, economics of health and healthcare, patient safety, quality management, financing, payor mixture, healthcare-specific laws and regulations, and information systems as they relate to healthcare data
- 2. **Comprehensive business skills:** decision-making skills, relationship management skills, data interpretation and analytic skills, managerial professionalism, teamwork and collaboration skills related to various actors in healthcare (including practitioners), leadership skills, and strategy skills
- 3. **Experiential learning:** hands-on learning in a healthcare setting, application of HCM curriculum to real world experiences

For more information on the undergraduate major in Healthcare Management, please visit: <https://ivybusiness.iastate.edu/degree/healthcare-management/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Healthcare Management will:

- 1. Be effective communicators
- 2. Be effective collaborators
- 3. Be problem solvers
- 4. Understand business concepts
- 5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), healthcare management majors must also complete:

Required Courses:

HCM 301	Introduction to the US Healthcare Industry	3
HCM 302	Economics for Healthcare Managers	3
HCM 303	Healthcare Quality Management	3
HCM 401	Financial Management for Healthcare Organizations	3
HCM 402	Law and Regulatory Environment in Healthcare	3
HCM 403	Healthcare Information Systems	3

Experiential Learning (choose one):

HCM 391X	Internship in Healthcare Management	3
HCM 398X	Cooperative Education *	R
HCM 490X	Independent Study in Healthcare Management	3

Elective Courses (choose one or two): \*

HCM 404X	Cost-Effectiveness Analysis in Healthcare	3
MGMT 422	Negotiation and Conflict Resolution	3
MGMT 471	Introduction to Human Resource Management	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
ENTSP 410	Social Entrepreneurship	3
MKT 351	Services Marketing	3
COMST 450B	Special Topics in Communication Studies: Health Communication	3
GERON 563	Environments for the Aging	3
GLOBE 330	Global Health Disparities	3
H S 310	Community and Public Health	3
PSYCH 485	Health Psychology	3

\* If HCM 398X is taken for your experiential learning component, you must choose TWO elective courses from the list to fulfill the requirements for the major.

Total Credits: 24

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors

only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Healthcare Management, B.S.

*Sample 4-Year Plan (Your plan may differ)*

### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 HUM/SOC SCI	3
ENGL 150	3 ACCT 284	3
MATH 150	3 Global/International Perspective <sup>@</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 SP CM 312	3
MKT 340	3 ACCT 215	3
MATH 151	3 PHIL 230	3
ENGL 250	3 MGMT 371	3
Natural Science	3 ENTSP 310	3
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
ENGL 302	3 HCM 303	3
FIN 301	3 HCM 401	3
SCM 301	3 MIS 301	3
HCM 301	3 MGMT 372	3
HCM 302	3 US Diversity <sup>#</sup>	3
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
HUM/SOC SCI	3 MGMT 478 <sup>*</sup>	3
Global/International Perspective <sup>@</sup>	3 HUM/SOC SCI	3
HCM 402	3 HCM 403	3
HCM 391X: Internship in Healthcare Management	3 HCM Elective	3
General Elective	5 General Electives	3
	<b>17</b>	<b>15</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

### Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Human Resource Management

The field of human resource management (HRM) is a core contributor to an efficient and effective organization. HRM is focused on ensuring that organizations have employees with the right knowledge, skills, and abilities to achieve their objectives. HR professionals deliver the effective and necessary recruitment, training, development, and performance management processes that are crucial to sustained organizational success. Our HRM major prepares graduates for success by integrating relevant HR content knowledge and professional skills with a contemporary data-driven perspective that organizations value.

### Undergraduate Major in Human Resource Management

**For undergraduate curriculum in business, major in human resource management.**

The Department of Management and Entrepreneurship offers a major in human resource management. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for

the bachelor of science (B.S.) degree, and 21 additional credits in the major.

The instructional objective of the Human Resource Management program is to provide a well-rounded professional education in human resource management. Such an education should provide the student with:

1. knowledge and technical expertise in the functional areas of human resource management, including recruiting, selection, training and development, performance management, compensation and benefits, and employment law
2. relationship management skills, professionalism and business partnering skills, teamwork and collaboration skills, listening skills, and leadership skills
3. critical and analytical thinking, analytical skills, data interpretation and communication skills

For more information on the undergraduate major in Human Resource Management, please visit: <https://ivybusiness.iastate.edu/degree/human-resource-management/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Human Resource Management will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), human resource management majors must also complete:

Required Courses (18 credits):

MGMT 471	Introduction to Human Resource Management	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
MGMT 473	Evidence-Based Decision Making in Human Resource Management	3
MGMT 475	Employment Law for Human Resource Management	3
MGMT 474	Compensation and Benefits	3
MGMT 476	Applied Projects in Human Resource Management	3

Elective Courses (3 credits):

MGMT 320	Corporate Entrepreneurship	3
MGMT 470	Leadership and Change Management	3

MGMT 422	Negotiation and Conflict Resolution	3
MIS 436	Introduction to Business Analytics	3

Total Credits: 21

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Human Resource Management, B.S.

*Sample 4-Year Plan (Your plan may differ)*

### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 PHIL 230	3
ENGL 150	3 ACCT 284	3
MATH 150	3 Global/International Perspective <sup>@</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 SP CM 312	3
MGMT 371	3 ACCT 215	3
MATH 151	3 ENTSP 310	3
ENGL 250	3 Core Business Course	3
Natural Science	3 HUM/SOC SCI	3
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
ENGL 302	3 MGMT 473	3
Core Business Course	6 MGMT 475	3
MGMT 471	3 Core Business Course	6
MGMT 472*	3 HUM/SOC SCI	3
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
MGMT 474	3 MGMT 478 <sup>#</sup>	3
HRM Elective	3 MGMT 476	3
Global/International Perspective <sup>@</sup>	3 HUM/SOC SCI	3

General Electives	8 General Electives	6
	17	15

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

\* MGMT 472 satisfies the US Diversity requirement

# Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

**Graduation Requirements:**

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree** requirements.

## Graduate Programs

The Department of Management and Entrepreneurship participates in the PhD in Business and Technology program.

### Ph.D. in Business and Technology

The doctoral specialization in management (MGMT) will prepare students to conduct and publish scholarly research in management, including the sub-fields of strategy, organizational behavior, and human resource management. In addition to curriculum in these core areas, students will also take courses in research methods and the closely-related area of entrepreneurship.

The goal of this program is to prepare students to compete for tenure-track positions at leading research universities in the United States and abroad. As a doctoral candidate, students will learn how to conduct impactful research, and they are expected to develop a research pipeline

and publish their work in top academic journals before entering the job market.

### Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Management, please visit: <https://www.ivybusiness.iastate.edu/phd/phd-entrepreneurship-and-management/>

## International Business

International business is a multidisciplinary field dedicated to understanding how to successfully formulate and execute commercial activity that spans national borders. Contemporary issues related to environmental concerns, political instability, and human rights have made international business decisions more complicated for organizations, leading to a global re-evaluation of how business should be conducted internationally. Whether you desire a career working internationally or simply want to understand how the broader business environment affects fundamental organizational decisions for domestic firms, our International Business program provides a broad global perspective to inform your world view and help you develop business acumen through an exploration of how business intersects with politics, economic considerations, and culture.

### Undergraduate Secondary Major in International Business

**For undergraduate curriculum in business, secondary major in International Business.**

#### Administered by the Department of Management and Entrepreneurship.

The major is designed to provide a strong common foundation in international business with two required international overview courses.

In addition, students are encouraged to take additional coursework with relevance to their business and career interests, with business-specific courses spanning numerous functional areas and general cultural classes covering numerous regions of the world. Students also have the opportunity to shape their international exposure via multiple study abroad options or via additional coursework at Iowa State.

For information on the secondary major in International Business, make an appointment (<https://cyclones.campus.eab.com/pal/AG7HsCRKhM/>) through Navigate to see the Ivy College of Business International Programs Coordinator, located in 2139 Gerdin Business Building or email [ivyintl@iastate.edu](mailto:ivyintl@iastate.edu).



For more information on the undergraduate secondary major in International Business, please visit: <https://ivybusiness.iastate.edu/degree/international-business/>

## Student Learning Outcomes

Upon graduation, undergraduate students with a secondary major in international business will:

1. Understand the global business environment and how it connects to their primary major
2. Be effective communicators in intercultural and international settings
3. Understand how culture, history, politics, and economics connect to business practices and operations both domestically and internationally
4. Develop intercultural skills required for success in business

## Secondary Major in International Business

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), the requirements for the secondary major in International Business are met by successful completion of the following:

### International Overview (6 credits)

BUSAD 301 Introduction to International Business. This course focuses on the principles and practice of international business across functional areas, with an emphasis on comparing the legal, political, economic, and cultural dimensions of domestic and international business.

MGMT 414 International Management . The nature and economic role of the multinational firm and entrepreneurial ventures, including the impact of legal, political, and cultural variables upon firm performance and managerial activity; case studies illustrate interdependent nature of functional areas of business projected across national boundaries.

### Business Focus (6 credits)\*

Select two courses from the list below:

ACCT 496	Accounting in the Global Economy	3
ENTSP 367	International Entrepreneurship	3
ECON 355	International Trade and Finance	3
ECON 385	Economic Development	3
ECON 455	International Trade	3
ECON 457	International Finance	3
FIN 480	International Finance	3
FIN 491	International Study Course in Global Capital Markets	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
MIS 495	Executive Presentation and Analysis	3
MKT 448	Global Marketing	3
MKT 492	Comparative Marketing	3

SCM 466	Global Trade Management	3
SCM 491	International Live Case and Study Tour	3
SCM 473	War and Peace and Supply Chains	3

\* Additional business-focused courses incorporating an international travel component may be able to be applied towards fulfilling this requirement with approval of the Ivy International Programs Coordinator.

## Global Engagement, Awareness, and Regional Perspective Requirement

Students can fulfill this portion of the IBUS major by completing **one** of the three options outlined below:

- Option 1:
  - One semester abroad, earning at least 12 credits AND
  - BUSAD 392X: Contextualizing Your International Experience (3 cr.), taken the semester after returning from abroad<sup>^</sup> AND
  - One course from the approved Global Awareness courses below<sup>§</sup>
- Option 2:
  - One faculty-led study abroad program (may use a course from the Business Focus to meet this) AND
  - One Regional Focus course from the list below with relevance to the chosen study-abroad program AND
  - One course from the approved Global Awareness courses below<sup>§</sup>
- Option 3:
  - Plan of study approved by the Ivy International Programs Coordinator
    - Please note, in some instances international travel may not be required to fulfill the IBUS major—see the Ivy International Programs Coordinator for more information.

<sup>^</sup> In the event that students complete their semester abroad during their final semester, this class may be taken concurrently.

<sup>§</sup> Course(s) may be taken while studying abroad.

## Global Awareness (3 credits)

Select 3 credits from the list below:

ANTHR 220	Globalization and Sustainability	3
ANTHR 230	Globalization and the Human Condition	3
ANTHR 336	Culture and Capitalism	3
C R P 291	World Cities and Globalization	3
C R P 376	Rural, Urban and Regional Economics	3
C R P 429	Planning in Developing Countries	3

DSN S 304	Global Challenges: Intro to UN Sustainable Development Goals	3
INTST 235	Introduction to International Studies	3
INTST 250	The World's Regions in a Global Context	3
INTST 350	Topics in International Studies	2-4
MKT 484	Technology, Globalization and Culture	3
POL S 381	International Political Economy	3
SOC 348	Global Poverty, Resources and Sustainable Development	3
SOC 411	Social Change in Developing Countries	3
WGS 435	Gender, Globalization and Development	3
WLC 119	Introduction to World Languages	3
WLC 270	Cultures in Transition	3

### Regional Focus\*

#### Africa

Language\*: WLC 107 Introduction to Swahili

AF AM 310	Africa to 1880	3
AF AM 311	Africa under Colonial Rule	3
AF AM 355	Understanding Sub-Saharan Africa	3
RELIG 358	Islam	3

#### Mid-East

Language\*: Arabic

ARABC 375	Arab Culture	3
ANTHR 335	Peoples and Cultures of the Middle East	3
HIST 435	History of the Modern Middle East	3
POL S 350	Politics of the Middle East	3
RELIG 358	Islam	3
RELIG 359	The Quran	3

#### China

Language\*: Chinese

CHIN 372	Introduction to Chinese Culture	3
CHIN 375	China Today	3-4
ECON 387	Economies of China and India	3
HIST 207	Chinese Civilization	3
HIST 336	History of Modern China I	3
HIST 337	History of Modern China II	3
POL S 342	Chinese Politics	3

#### India

WLC 352	Religions of India	3
ECON 387	Economies of China and India	3
RELIG 358	Islam	3

#### Japan

See the Ivy College International Programs Coordinator for options.

#### Russia

Language\*: Russian

HIST 421	History of Russia I	3
HIST 422	History of Russia II	3
POL S 349	Politics of Russia and Eastern Europe	3
RUS 375	Russia Today	3

#### Southern Europe

POL S 346	European Politics	3
RELIG 332	Catholicism	3

#### Spain

Language\*: Spanish

SPAN 321	Spanish Civilization	3
SPAN 323	Spain Today	3

#### Italy

Language\*: ITAL 107 Intensive Beginning Italian

CL ST 403	Roman Civilization.	3
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#### France

Language\*: French

FRNCH 320	France Today	3
FRNCH 476	French Culture and Society in English	3-4
HIST 419	History of Modern France	3

#### Northern Europe

POL S 346	European Politics	3
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#### German

Language\*: German

GER 320	Germany Today	3
GER 330	German Literature and Culture	3
GER 476	Topics in German Cultural Studies	3-4
HIST 424	History of Modern Germany	3

#### UK

HIST 327	History of the British Empire	3
POL S 348	British Government and Politics	3

#### Latin America

Language\*: Spanish or Portuguese

HIST 340	History of Latin America I	3
HIST 341	History of Latin America II	3
HIST 441	History of Modern Mexico and Central America	3

POL S 343	Latin American Government and Politics	3
PORT 375	Brazil Today	3
RELIG 332	Catholicism	3
SPAN 322	Latin American Civilization	3
SPAN 324	Latin America Today	3

\* Relevant university-level foreign language courses can be used to satisfy a Regional Focus requirement. Please note that sign language courses are not considered an approved foreign language.

Fifteen of the 18 credits required for the International Business secondary major must not be used for the primary major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

## Undergraduate Minor in International Business

Students with a major in the Ivy College of Business may earn a minor in International Business by completing 15 credits of approved coursework. The minor requires one course from the approved International Overview courses, two courses from the approved Business Focus courses, and by completing the Faculty-Led Global Awareness track, or the Foreign Language Global Awareness track, or through a plan of study approved by the Ivy International Programs Office. The minor must include at least six credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

### International Overview (3 credits)

Choose one course from the list below:

BUSAD 301 Introduction to International Business. This course focuses on the principles and practice of international business across functional areas, with an emphasis on comparing the legal, political, economic, and cultural dimensions of domestic and international business.

MGMT 414 International Management. The nature and economic role of the multinational firm and entrepreneurial ventures, including the impact of legal, political, and cultural variables upon firm performance and managerial activity; case studies illustrate interdependent nature of functional areas of business projected across national boundaries.

### Business Focus (6 credits)\*

Select two courses from the list below:

ACCT 496	Accounting in the Global Economy	3
ENTSP 367	International Entrepreneurship	3

ECON 355	International Trade and Finance	3
ECON 385	Economic Development	3
ECON 455	International Trade	3
ECON 457	International Finance	3
FIN 480	International Finance	3
FIN 491	International Study Course in Global Capital Markets	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
MIS 495	Executive Presentation and Analysis	3
MKT 448	Global Marketing	3
MKT 492	Comparative Marketing	3
SCM 466	Global Trade Management	3
SCM 491	International Live Case and Study Tour	3
SCM 473	War and Peace and Supply Chains	3

\* Additional business-focused courses incorporating an international travel component may be able to be applied towards fulfilling this requirement with approval of the Ivy International Programs Coordinator.

## Global Awareness

Complete one of the two options below:

- Option 1:
  - One faculty-led study abroad program (may use a course from the Business Focus to meet this) AND
  - One Regional Focus<sup>^</sup> course from the list found here <https://catalog.iastate.edu/collegeofbusiness/internationalbusiness/#curriculumtext/> with relevance to the chosen study-abroad program AND
  - One course from the approved Global Awareness courses found here: <https://catalog.iastate.edu/collegeofbusiness/internationalbusiness/#curriculumtext/>
- Option 2:
  - Plan of study approved by the Ivy International Programs Coordinator
    - Please note, in some instances international travel may not be required to fulfill the IBUS minor—see the Ivy International Programs Coordinator for more information.

<sup>^</sup> Relevant university-level foreign language courses can be used to satisfy a Regional Focus requirement. Please note that sign language courses are not considered an approved foreign language.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors

only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in International Business, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Management

Management is a broadly defined discipline encompassing a diverse set of activities that span all business functions. By ensuring the effective utilization of resources, sound management is critical to organizational success.

Designed around learning critical conceptual, technical, and human skills, the management major is structured to prepare students to be successful organizational leaders. Whether taken as a stand-alone major or as a complement to another technical skill set, this skills-based approach ensures management majors have both the theoretical and practical background to excel in a wide range of organizational settings.

### Undergraduate Major in Management

**For undergraduate curriculum in business, major in management.**

The Department of Management and Entrepreneurship offers a major in management. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the Bachelor of Science (B.S.) degree, and 18 additional credits in the major.

The required courses at the core of the management major build foundational managerial skills with broad applicability (e.g. leadership, conflict mitigation, and strategic-thinking skills). Elective courses provide additional contextual knowledge (e.g. managing in a family or international business) as well as complementary managerial skills (e.g. motivational, analytic, project management and sales skills), allowing students to accentuate their skill set in areas best aligned with their career objectives.

Students will demonstrate awareness for the role of evidence, diversity, ethics and technology in business decision-making and the impact of external forces and global issues on organizations. Students will display the ability to think critically, to communicate effectively and to contribute constructively to effective team performance. Required courses in the major provide a variety of rich developmental experiences that include applied learning, case analysis, research projects, team-based active learning projects, and interaction with guest speakers, in addition to traditional classroom lectures and discussions.

For more information on the undergraduate major in Management, please visit: <https://ivybusiness.iastate.edu/degree/management/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Management will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>) the Management major requires students to take 18 credit hours in the Management area, including 12 credit hours of required core courses and 6 credit hours of electives.

Required Courses (12 credits):

MGMT 370	Managing Organizations	3
MGMT 422	Negotiation and Conflict Resolution	3
MGMT 470	Leadership and Change Management	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3

Elective Courses (6 credits):

Select two courses from the following list:

MGMT 320	Corporate Entrepreneurship	3
MGMT 381	Managing Family Businesses	3
MGMT 414	International Management	3
MGMT 421X	Personality and Management	3
MGMT 471	Introduction to Human Resource Management	3
MGMT 473	Evidence-Based Decision Making in Human Resource Management	3
MGMT 481X	Nonprofit Management *	3
MIS 340	Project Management	3
MKT 342	Foundation Of Personal Selling	3
MKT 367	Consultative Problem Solving	3

\* Course not offered on a regular basis. Students should consult with their academic advisor about terms of offering.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors

only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Management, B.S.

*Sample 4-Year Plan (Your plan may differ)*

### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 PHIL 230	3
ENGL 150	3 ACCT 284	3
MATH 150	3 Global/International Perspective <sup>@</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 SP CM 312	3
MGMT 371	3 ACCT 215	3
MATH 151	3 HUM/SOC SCI	3
ENGL 250	3 Business Core Course	3
Natural Science	3 General Elective	3
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
MGMT 370	3 MGMT 422	3
Business Core Courses	6 MGMT 472	3
US Diversity <sup>#</sup>	3 Business Core Courses	6
General Elective	3 General Elective	3
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
MGMT 470	3 MGMT 478 <sup>*</sup>	3
MGMT Elective	3 MGMT Elective	3
HUM/SOC SCI	3 HUM/SOC SCI	3
Global/International Perspective <sup>@</sup>	3 General Electives	5
ENGL 302	3	
Business Core Course	3	
	<b>18</b>	<b>14</b>

**Total Credits: 122**

<sup>@</sup>Courses in these requirements may also be used as Global Perspective.

<sup>#</sup> US Diversity courses may be used to satisfy HUM/SOC SCI.

<sup>\*</sup> Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Undergraduate Minor in Management

The Department of Management and Entrepreneurship also offers a minor for non-Management majors in the Ivy College of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

Required Courses (6 credits):

MGMT 371	Organizational Behavior	3
MGMT 478	Strategic Management	3

Elective Courses (9 credits):

Select nine credit hours from 300- or 400-level Management courses (excluding MGMT 372).

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Management, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Graduate Programs

The Department of Management and Entrepreneurship participates in the full-time and part-time Master of Business Administration (MBA) and in the PhD in Business and Technology programs.

### Master of Business Administration (MBA)

The MBA is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students can obtain a specialization in Leadership.

### Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Leadership, please visit: <https://ivybusiness.iastate.edu/mba-full-time-details/>

### Ph.D. in Business and Technology

The doctoral specialization in management (MGMT) will prepare students to conduct and publish scholarly research in management, including the sub-fields of strategy, organizational behavior, and human resource management. In addition to curriculum in these core areas, students will also take courses in research methods and the closely-related area of entrepreneurship.

The goal of this program is to prepare students to compete for tenure-track positions at leading research universities in the United States and abroad. As a doctoral candidate, students will learn how to conduct impactful research, and they are expected to develop a research pipeline and publish their work in top academic journals before entering the job market.

### Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Management, please visit: <https://ivybusiness.iastate.edu/phd/phd-entrepreneurship-and-management/>

## Management Information Systems

Management Information Systems is the analysis and use of information systems and technologies to support problem solving and decision making within and across organizations. Organizations and companies use data, most often in digital form, to conduct nearly every part of their businesses and functions. The program provides students with the core knowledge related to every dimension of information systems and technologies, including the creation and implementation of software and databases, to information security, analytics, and the user interface. The program takes a balanced approach with both technical and managerial coursework.

### Undergraduate Major in Management Information Systems

**For undergraduate curriculum in business, major in management information systems.**

The Department of Information Systems and Business Analytics offers a major in management information systems. Students will complete the general education requirements (including business foundation courses), business core requirements for the bachelor of science (BS) degree, and 18 additional credits in the major.

The instructional objective of the Management Information Systems major is to prepare students for professional careers with a wide variety of firms and roles, ranging from small start-up firms to large multinational corporations. Common job titles include business analyst and systems analyst. Students are also pursuing careers in Information Technology consulting.

For more information on the undergraduate major in Management Information Systems, please visit: <https://ivybusiness.iastate.edu/degree/management-information-systems/>

### Student Learning Outcomes

Upon graduation, undergraduate students majoring in Management Information Systems will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>) the Management Information Systems major requires students to take 18



credit hours in the management information systems area, including 12 credit hours of required core courses and 6 credit hours of electives.

Required Courses (12 credits):

MIS 307	Intermediate Business Programming	3
MIS 310	Information Systems Analysis	3
MIS 320	Database Management Systems	3
MIS 340	Project Management	3

Elective Courses (6 credits):

Select 6 credits of MIS department courses from the list below:

MIS 315	Business Data Streams and Issues	3
MIS 367	Consultative Problem Solving	3
MIS 368	Marketing Analytics	3
MIS 403	Healthcare Information Systems	3
MIS 407	Advanced Business Programming	3
MIS 410X	Blockchain and Cryptocurrency	3
MIS 435	Cybersecurity in Business	3
MIS 436	Introduction to Business Analytics <sup>#</sup>	3
MIS 440	Supply Chain Information Systems	3
MIS 441X	Cybersecurity Analytics	3
MIS 445	Enterprise Cybersecurity	3
MIS 446	Advanced Business Analytics <sup>#</sup>	3
MIS 447	Information Systems Development	3
MIS 450	Enterprise Resource Planning Systems in Supply Chain	3
MIS 495	Executive Presentation and Analysis <sup>*</sup>	3

<sup>#</sup> STAT 326 is a prerequisite for these courses.

<sup>\*</sup> Only 3 credits of MIS 495 may count as a Management Information Systems major choice elective.

NOTE: Management Information Systems majors must take MIS 207 Fundamentals of Programming for Business and Analytics as part of the supporting courses.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Management Information Systems, B.S.

*Sample 4-Year Plan (Your plan may differ)*

#### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 PHIL 230	3
ENGL 150	3 ACCT 284	3
MATH 150	3 Global/International Perspective <sup>@</sup>	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 MIS 307	3
MIS 301	3 SP CM 312	3
MIS 207	3 Natural Science	3
ENGL 250	3 HUM/SOC SCI	3
MATH 151	3 General Elective	3
	<b>15</b>	<b>15</b>

#### Junior

Fall	Credits Spring	Credits
MIS 310	3 MIS 320	3
Business Core Courses	6 MIS 340	3
ACCT 215	3 Business Core Courses	6
US Diversity <sup>#</sup>	3 ENGL 302	3
	<b>15</b>	<b>15</b>

#### Senior

Fall	Credits Spring	Credits
MIS Elective	3 MIS Elective	3
HUM/SOC SCI	3 HUM/SOC SCI	3
Global/International Perspective <sup>@</sup>	3 MGMT 478 <sup>*</sup>	3
Business Core Courses	6 General Electives	6
General Electives	2	
	<b>17</b>	<b>15</b>

**Total Credits: 122**

<sup>@</sup> Courses in these requirements may also be used as Global Perspective.

<sup>#</sup> US Diversity courses may be used to satisfy HUM/SOC SCI.

- \* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

#### Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. Grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Undergraduate Minor in Management Information Systems

The Department of Information Systems and Business Analytics also offers a minor for non-Management Information Systems majors in the Ivy College of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

#### Required Course (3 credits):

MIS 301	Management Information Systems	3
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#### Elective Courses (12 credits):

Select twelve credit hours from 300 or 400 level MIS courses \*

- \* Only 3 credits of MIS 495 Executive Presentation and Analysis may count as a MIS minor choice elective.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors

only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Management Information Systems, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Concurrent Degrees

The Department of Information Systems and Business Analytics offers four concurrent degree programs that allow qualified students to be admitted to the following Masters programs while completing their undergraduate degree. Students can double count up to 6 credits of coursework between the degrees, allowing them to complete both a Bachelors and a Master's degree in as little as five years. The concurrent degree programs offered include:

- B.S. Management Information Systems (MIS) and Master of Science in Information Systems (MSIS)
- B.S. Management Information Systems (MIS) and Master of Business Analytics (MBAN)
- B.S. Business Analytics (BUSAN) and Master of Science in Information Systems (MSIS)
- B.S. Software Engineering (S E) and Master of Science in Information Systems (MSIS)

For more information on any of the concurrent programs listed above, please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## Graduate Programs

The Department of Information Systems and Business Analytics participates in the MS in Information Systems (MSIS), the MS in Healthcare Analytics and Operations (MHAO), the full-time and part-time Master of Business Administration (MBA) and the PhD in Business and Technology programs. The department also participates in an interdepartmental MS in Cyber Security as well as in a master's and PhD program in Human Computer Interaction.

### Master of Science Information Systems (MSIS)

The MSIS is a 30-credit (minimum) curriculum designed around three interrelated areas – business foundation, IS core, and electives. All students are expected to be familiar with basic computing skills before entering the program. The MSIS program will educate students on applying IS theory and concepts to modern IS development through classes that enable them to learn and use the latest software in application projects. Students graduating from the program will have advanced technical and managerial skills to develop and manage information systems projects.

## Student Learning Outcomes

Upon graduation, MSIS students will:

1. Work effectively in teams
2. Be critical thinkers in the field of information systems
3. Develop an awareness of the ethical dimensions and consequences of business decisions
4. Have strong written communication skills
5. Have strong oral communication skills

For more information about the MSIS program, please visit: <https://ivybusiness.iastate.edu/degree/msis/>

## Masters in Healthcare Analytics and Operations (MHAO)

Students graduating from the Masters in Healthcare Analytics and Operations program will apply data and appropriate models to analyze operations and supply chains to develop and present actionable insights leading to better outcomes in the healthcare industry. Healthcare analytics uses historical and current data to predict trends and optimize operations, bringing benefits to patients, medical professionals, and healthcare supply chain partners.

For more information about the Master of Healthcare Analytics and Operations program, please visit: <https://www.ivybusiness.iastate.edu/degree/master-of-healthcare-analytics-and-operations/>

## Double Graduate Degree

The Department of Information Systems and Business Analytics participates in one double degree program at the graduate level.

Students can simultaneously pursue a double degree in Master of Business Administration (MBA) and Master of Healthcare Analytics and Operations (MHAO). The Double Degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on the double degree in Master of Business Administration (MBA) and Master of Healthcare Analytics and Operations (MHAO), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

## Master of Business Administration (MBA)

The MBA program is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core business courses and the remaining 18 credits are graduate electives. Within the MBA program, students may obtain a specialization in information systems or healthcare analytics and operations.

## Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Information Systems or Healthcare Analytics and Operations, please visit: <https://ivybusiness.iastate.edu/degree/mba/>

## Ph.D. in Business and Technology

The PhD in Business and Technology is a 56-credit curriculum (minimum) which includes a 12-credit dissertation designed around four interrelated areas—core, specialization, minor, and research methods—and the dissertation. The Management Information Systems (MIS) specialization examines issues related to the development, building, management, and use of information and knowledge-based technologies. Such technologies enable users to collect organizational data, provide a platform for organizing and disseminating the data, and offer operational, decision support, and knowledge management tools through which users can leverage data and information for making better organizational decisions. Students in the MIS specialization will study areas such as information technology analysis and development, database and knowledge management systems, decision support and data mining, human computer interaction, system security and integrity, and project management and collaborative teamwork.

## Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in MIS, please visit: <https://ivybusiness.iastate.edu/degree/phd/phd-information-systems/>

## Graduate Certificates

### Enterprise Cybersecurity Management

The graduate certificate in enterprise cybersecurity management will equip business professionals with basic concepts and techniques in cybersecurity and the management of information assets, including understanding cyber threat and choosing appropriate protections, enterprise cyber risk management, budgeting for cybersecurity, policies, procedures, human relations issues, and compliance and legal issues present in the modern organization.

The certificate is for working professionals as well as students enrolled in graduate programs. The certificate is available on campus in Ames and at Capital Square in Des Moines.

For more information about the graduate certificate in Enterprise Cybersecurity Management, please visit: <https://ivybusiness.iastate.edu/cybersecurity-grad-certificate/>

### Business Analytics

The graduate certificate in business analytics will address the challenges of dealing with issues of "big data" and its analysis to extract actionable insights, equips business professionals with the basic analytic concepts and techniques necessary in various areas of business such as marketing, supply chain, operations, forensics, and risk management. Students will have a foundation in data management, business analytics, modeling, and communicating through data visualization.

The certificate is for working professionals as well as students enrolled in graduate programs who are employed or seeking a career as business analysts, analytic systems designers, and data scientists to help improve business performance. The certificate is available online, on campus in Ames and at Capital Square in Des Moines.

For more information about the graduate certificate in business analytics, please visit: <https://ivybusiness.iastate.edu/ba-certificate/>

## Marketing

A major in marketing acquaints students with the managerial decisions and actions that surround the satisfaction of customer needs in the purchase and use of goods and services. Examples of marketing decision areas are product development, pricing, marketing communication, customer relationships, social media, marketing analytics, and personal selling. Completion of the major prepares students for careers such as product manager, marketing analyst, digital marketing specialist, marketing consultant, advertising or promotions manager, marketing researcher, sales representative or manager, social media coordinator, retail management, and special events manager; in the public and private sectors.

### Undergraduate Major in Marketing

**For undergraduate curriculum in business, major in marketing.**

The Department of Marketing offers a major in marketing. Students will complete the general education requirements (including business foundation courses), supporting courses/major prerequisites, business core requirements for the bachelor of science (BS) degree, and 18 additional credits in the major.

The instructional objective of the Marketing major is to provide knowledge of the marketing process and an understanding of its functions. Students are expected to develop decision-making skills, computational skills, and communication skills with appreciation for global marketplace and ethical concerns.

For more information on the undergraduate major in Marketing, please visit: <https://ivybusiness.iastate.edu/degree/marketing/>

### Student Learning Outcomes

Upon graduation, undergraduate students majoring in Marketing will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

### Curriculum:

Required and elective marketing major courses can be combined into two distinct tracks: marketing analytics, and marketing management.

**NOTE:** If you are interested in sales, the Marketing department offers an undergraduate certificate in Professional Sales. The Professional Sales Certificate has different required Marketing courses, and a host of different electives that are available from departments around campus.

For more information on the undergraduate certificate in Professional Sales, please visit: <https://catalog.iastate.edu/collegeofbusiness/marketing/#undergraduatecertificate>

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusiness>), marketing majors must also complete the following:

Required Courses (9 credits):

MKT 444	Fundamentals of Marketing Analytics	3
MKT 342	Foundation Of Personal Selling <sup>#</sup>	3
MKT 443	Strategic Marketing Management	3

Elective Courses (9 credits):

Select 9 credits of Marketing department courses, OR select one of the two Marketing elective TRACKS described below.

Optional Digital Marketing and Marketing Analytics Track (9 credits)

Select 9 credits:		
MKT 361	Social Media Marketing Strategy	3
MKT 362	Digital Marketing	3
MKT 363X	Creative Tools for Digital Marketing	3
MKT 368	Marketing Analytics	3
MKT 445	Customer Relationship Management	3
MKT 452	Sales Enablement Tools and Technology	3
MKT 456X	Digital Marketing Analytics	3
MKT 457X	Digital Marketing Applications in Customer Journey	3

## Optional Marketing Management Track (9 credits)

## Select 9 credits:

MKT 351	Services Marketing	3
MKT 361	Social Media Marketing Strategy	3
MKT 362	Digital Marketing	3
MKT 367	Consultative Problem Solving	3
MKT 410	Promotional Strategy	3
MKT 442	Sales Management <sup>#</sup>	3
MKT 447	Consumer Behavior	3
MKT 448	Global Marketing	3
MKT 450	Advanced Professional Selling <sup>#</sup>	3
MKT 451	Omnichannel Marketing	3
MKT 453	Brand Management	3
MKT 454	Entrepreneurial Marketing	3
MKT 455X	Managing for Creativity and Innovation	3
MKT 458X	New Product Marketing	3
MKT 484	Technology, Globalization and Culture	3
MKT 492	Comparative Marketing	3
MKT 495	Live Cases in Marketing <sup>*</sup>	3

\* Only 3 credits of MKT 495 may count as a Marketing major choice elective.

# Required courses for the undergraduate certificate in Professional Sales. See the Undergraduate Certificate tab above for more information.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Marketing, B.S.

## Sample 4-Year Plan (Your plan may differ)

## Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 HUM/SOC SCI	3
ENGL 150	3 ACCT 284	3

MATH 150	3 SP CM 312	3
LIB 160	1 BUSAD 203	1
<b>14</b>		<b>16</b>

## Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 MKT 342	3
MKT 340	3 Core Business Course	3
MATH 151	3 ACCT 215	3
ENGL 250	3 Global/International Perspective <sup>@</sup>	3
Natural Science	3 HUM/SOC SCI	3
<b>15</b>		<b>15</b>

## Junior

Fall	Credits Spring	Credits
PHIL 230	3 MKT Elective	3
MKT 444	3 Core Business Courses	6
Core Business Course	3 Global/International Perspective <sup>@</sup>	3
US Diversity <sup>#</sup>	3 General Elective	3
MKT Elective	3	
<b>15</b>		<b>15</b>

## Senior

Fall	Credits Spring	Credits
MKT Elective	3 MKT 443	3
ENGL 302	3 MGMT 478 <sup>*</sup>	3
Core Business Courses	6 HUM/SOC SCI	3
General Elective	5 General Electives	6
<b>17</b>		<b>15</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

## Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).

5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.

6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.

7. All 300-level and higher business credits must be earned at a four-year college.

8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

## Undergraduate Minor in Business and Technology Consulting

The Department of Marketing offers a minor in Business and Technology Consulting, which is available to all undergraduate students at Iowa State University.

Management consulting is a profession that constantly attracts top talents across the world. By working with different clients to solve complex problems every day, consultants have many exclusive opportunities to interact with senior executives, build a broad range of business expertise in different industries, and drive influential decision-making. As a result, many consultants experience faster career progression and end up becoming influential leaders or successful entrepreneurs. To prepare students for this exciting and challenging career, our business and technology consulting minor will guide you through a set of core courses, the majority of which contain significant experiential learning components. This training ensures that students leave the minor ready to become adaptable consultants equipped with robust problem-solving, communication, and leadership skills.

The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

### Required Courses (6 credits):

MKT 367	Consultative Problem Solving	3
MIS 310	Information Systems Analysis <sup>^</sup>	3
or MKT 342	Foundation Of Personal Selling	

### Required Experiential Learning Course (3 credits):

Choose one of the following courses...

MIS 495	Executive Presentation and Analysis	3
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SCM 495	Executive Analysis and Presentations	3
MKT 495	Live Cases in Marketing	3

### Elective Courses (6 credits):

Select TWO elective courses from the list below. Students are encouraged to take electives that best align with their chosen course of study or projected career path.

SCM 340	Project Management	3
SCM 424	Process Management, Analysis, and Improvement	3
SCM 440	Supply Chain Information Systems	3
SCM 450	Enterprise Resource Planning Systems in Supply Chain	3
MIS 320	Database Management Systems	3
MIS 435	Cybersecurity in Business	3
MIS 436	Introduction to Business Analytics <sup>*</sup>	3
MKT 368	Marketing Analytics	3
MKT 445	Customer Relationship Management	3
MGMT 320	Corporate Entrepreneurship	3
MGMT 473	Evidence-Based Decision Making in Human Resource Management	3
FIN 415	Business Financing Decisions	3
FIN 435	Venture Capital, Private Equity, and Mergers and Acquisitions	3
ACCT 315	Business Data Streams and Issues	3
ACCT 461	Entrepreneurship and Accounting Information	3
ACCT 384	Accounting Information Systems and Analytics	3
I E 305	Engineering Economic Analysis	3
I E 420	Engineering Problem Solving with R	3
I E 441	Industrial Engineering Design	3
I E 452	Introduction To Systems Engineering And Analysis	3
I E 470	Systems Engineering and Project Management	3
I E 481	e-Commerce Systems Engineering	3
I E 483	Data Mining	3
M E 412	Ethical Responsibilities of a Practicing Engineer	3
M E 415	Mechanical Systems Design	3
M E 416	Mechanism Design and Analysis	3
M E 475	Modeling and Simulation	3
M E 484	Technology, Globalization and Culture	3
STAT 332	Visual Communication of Quantitative Information	3
STAT 471	Introduction to Experimental Design	3
STAT 473	Introduction to Survey Sampling	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 482	Regression for Social and Behavioral Research	3



ECON 401	Topics in Microeconomics	3
ECON 416	Industrial Organization	3
ECON 418	Introduction to Game Theory	3
ECON 431	Managerial Economics	3
COM S 295	Programming-based problem solving practices	1
COM S 319	Construction of User Interfaces	3
COM S 363	Introduction to Database Management Systems	3
COM S 472	Principles of Artificial Intelligence	3
COM S 474	Introduction to Machine Learning	3
CPR E 329	Software Project Management	3
CPR E 331	Application of Cryptographic Concepts to Cyber Security	3
CPR E 414	Introduction to Software Systems for Big Data Analytics	4
CPR E 431	Basics of Information System Security	3

^ MIS majors should take MIS 435 instead of MIS 310 as the required course for the minor.

\* STAT 326 is a prerequisite for this course.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Non-business students may not take more than 9 credits of 300- or 400-level business courses.

NOTE: Students must follow college-specific rules in selecting courses.

The college representatives will be responsible for advising students in their college, and will inform students about the details of the college rules.

For more information on the undergraduate minor in Business and Technology Consulting, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Undergraduate Minor in Marketing

The Department of Marketing also offers a minor for non-Marketing majors in the Ivy College of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

Required Courses (6 credits):

MKT 340	Principles of Marketing	3
MKT 342	Foundation Of Personal Selling	3

Elective Courses (9 credits):

Select nine credit hours from 300- or 400-level Marketing courses. \*

\* Only 3 credits of MKT 495 may count as a Marketing minor choice elective.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Marketing, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Undergraduate Certificate in Professional Sales

### Purpose

The certificate in professional sales is a course of study administered by the Department of Marketing in the Ivy College of Business. It is designed for all undergraduate majors who wish to enhance their degree and employment possibilities by adding expertise in professional selling. The certificate program will equip students with knowledge and skills related to developing and managing mutually beneficial relationships with customers. The certificate program is built on a strong theoretical background but emphasizes applications and practice. The certificate provides students with an opportunity to learn about the ethical, technological, analytical, and global aspects of professional sales.

### Learning Outcomes

After completing the certificate in professional sales, students will be able to:

- Identify and describe the steps in a relational selling process to create value and achieve customer satisfaction,
- Apply the sales technology, skills and knowledge to business problems,
- Enhance oral communication skills and basic business writing skills,
- Build a network and develop professional relationships through corporate participation in the sales program, and
- Enhance career management options by gaining a better understanding of sales as a career option.

### Requirements

The certificate in professional sales requires the completion of at least 7 courses, totaling 21 credit hours. At least 12 credits should be taken at Iowa State University.

## Required Courses (12 credits):

MKT 340	Principles of Marketing	3
MKT 342	Foundation Of Personal Selling	3
MKT 442	Sales Management	3
MKT 450	Advanced Professional Selling	3
or MKT 452	Sales Enablement Tools and Technology	

## Elective Courses (9 credits):

Select 9 credits of electives from the following list:

A M D 275	Retail Merchandising	3
A M D 377	Visual Presentation and Promotions	3
ACCT 461	Entrepreneurship and Accounting Information *	3
ADVRT 336	Advertising Account Management	3
AESHM 222	Creativity on Demand	3
AESHM 238	Human Resource Management	3
AESHM 270F	Supervised Work Experience II: Event Management	1-2
AESHM 272	Fashion Show Production and Promotion	2-3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 340	Hospitality and Apparel Marketing Strategies	3
AESHM 365	Event, Hospitality, and Retail Risk Management	3
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AESHM 472	Fashion Show Management	2-3
AESHM 474	Entrepreneurship in Human Sciences	3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	3
ARTID 250	Fundamentals of Interior Design	2
ARTID 251	Human Factors in Interior Design	3
ARTID 261	Graphic Communication for Interior Design I	3
ARTID 263	Graphic Communication for Interior Design II	3
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	3
COMST 211	Interpersonal Communication	3
COMST 214	Professional Communication	3
COMST 218	Conflict Management	3
COMST 310	Intercultural Communication	3
COMST 311	Relational Communication	3
COMST 313	Leadership Communication Theories	3
COMST 314	Organizational Communication	3
COMST 317	Small Group Communication	3
COMST 319	Communication Training and Development	3
COMST 325	Nonverbal Communication	3
COMST 330	Computer Mediated Communication	3

COMST 450	Special Topics in Communication Studies	3
ECON 235	Introduction to Agricultural Markets	3
ECON 236	Agricultural Selling	3
ECON 334	Entrepreneurship in Agriculture	3
ECON 337	Agricultural Marketing	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3
ENGL 332	Visual Communication of Quantitative Information	3
ENTSP 310	Entrepreneurship and Innovation *	3
ENTSP 367	International Entrepreneurship *	3
ENTSP 410	Social Entrepreneurship *	3
ENTSP 480	Applied Entrepreneurship: Executing New Ventures *	3
ENTSP 485	Trends in Entrepreneurship *	3
EVENT 171	Introduction to Event Management	3
EVENT 277	Introduction to Digital Promotion in Event Management	3
EVENT 328	Incentive Meeting Management	3
EVENT 333	Entertainment Venue Management	3
EVENT 367	Event Sales	3
EVENT 373	Wedding Planning and Management	3
EVENT 378	Sustainable Event Management	3
EVENT 379	Nonprofit Fundraising Event Planning	3
EVENT 383	Sports Event Management	3
EVENT 471	Special Events Coordination	3
FIN 334X	Introduction to Financial Technologies and Cryptocurrencies *	3
FIN 371	Real Estate Principles *	3
FIN 472	Real Estate Finance *	3
HCM 301	Introduction to the US Healthcare Industry *	3
HCM 302	Economics for Healthcare Managers *	3
HORT 131	Floral Design	2
HORT 132	Wedding and Event Floral Design	2
HSP M 101	Introduction to the Hospitality Industry	3
HSP M 260	Global Tourism Management	3
HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 289	Contemporary Club Management	3
HSP M 320	Attractions and Amusement Park Administration	3
HSP M 383	Wine and Spirits in Hospitality Management	2
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	2
HSP M 385	Beer and Brewed Beverages in Hospitality Management	1

HSP M 437	Hospitality Technology Applications	3
HSP M 487	Fine Dining Management	3
HSP M 540	Strategic Marketing	3
I E 305	Engineering Economic Analysis	3
I E 430	Entrepreneurial Product Engineering	3
I E 434X	Entrepreneurial Product Engineering Design Project	3
I E 450	Technical Sales for Engineers	3
INTST 295	International Experience Abroad	1-8
INTST 350	Topics in International Studies	2-4
KIN 399	Recreational Sport Management	3
MGMT 422	Negotiation and Conflict Resolution *	3
MGMT 470	Leadership and Change Management *	3
MGMT 471	Introduction to Human Resource Management *	3
MKT 410	Promotional Strategy *	3
MKT 445	Customer Relationship Management *	3
MKT 451	Omnichannel Marketing *	3
MKT 455X	Managing for Creativity and Innovation *	3
MKT 456X	Digital Marketing Analytics *	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
PSYCH 280	Social Psychology	3
PSYCH 314	Motivation	3
PSYCH 327	Persuasion and Social Influence	3
PSYCH 380	Social Cognition	3
PSYCH 450	Industrial Psychology	3
SCM 340	Project Management *	3
SCM 440	Supply Chain Information Systems *	3
SCM 473	War and Peace and Supply Chains *	3
SCM 486	Principles of Purchasing and Supply Management *	3
SP CM 110	Listening	3
SP CM 312	Business and Professional Speaking	3
SP CM 323	Gender and Communication	3
WLC 119	Introduction to World Languages	3

\* Business courses listed as electives are available only to business majors. Non-business majors are limited to the 12 credits of required business courses for the certificate.

**In addition to the courses listed, independent study/special topics or other courses may count as electives for the certificate. Please**

**contact the director of the Professional Sales Program or the chair of the Marketing Department for prior approval of an elective.**

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students need to fulfill the course prerequisites set by the Ivy College of Business.

A minimum of 9 credits used for the certificate may not be used to meet any other department (e.g. MKT 340 & MKT 342 cannot count for marketing majors), college, or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

A certificate is not awarded until baccalaureate requirements are fulfilled.

Courses taken for the certificate may not be taken on a pass/not-pass basis.

A cumulative grade point average of at least 2.0 is required in courses taken for the certificate.

For more information on the undergraduate certificate in Professional Sales, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Graduate Programs

The Department of Marketing participates in the full-time and part-time Master of Business Administration (MBA) and the PhD in Business and Technology programs.

### Master of Business Administration (MBA)

The MBA is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students may develop an area of specialization in marketing.

### Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams
3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Marketing, please visit: <https://ivybusiness.iastate.edu/mba-full-time-details/>

## Ph.D. in Business and Technology

The PhD in Business and Technology with a Marketing (MKT) specialization is a 56 credit (minimum) curriculum designed around four interrelated areas (core, specialization, minor, and research methods) and dissertation. The focus of the specialization is on marketing issues relating to strategic decision making, understanding consumer preferences and behaviors, and using data analytics for increasing the performance of the firm.

## Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Marketing, please visit: <https://ivybusiness.iastate.edu/phd/phd-marketing/>

## Supply Chain Management

Supply chain management is an integrated program of study concerned with the efficient flow of information, materials, and products within and among organizations. Supply chain management involves the integration of business processes across organizations, from material sources and suppliers through manufacturing, and processing to the final customer. The program's balanced approach includes courses in the three core areas of supply chain management: procurement, operations, and logistics. Students will develop knowledge related to a wide variety of supply chain activities, including demand planning, purchasing, transportation management, warehouse management, inventory control, material handling, product and service support, information technology, and strategic supply chain management.

## Undergraduate Major in Supply Chain Management

**For undergraduate curriculum in business, major in supply chain management.**

The Department of Supply Chain Management offers a major in supply chain management. Students will complete the general education requirements (including business foundation courses), business core requirements for the bachelor of science (B.S.) degree, and 18 additional credits in the major.

The instructional objective of the supply chain management major is to prepare students for professional careers in logistics analysis, plant management, procurement, warehouse management, sustainable

supply chain management, and consulting. The curriculum provides the required theoretical and conceptual base and analytical methods for making sound operational and strategic business decisions related to all activities in a supply chain.

For more information on the undergraduate major in Supply Chain Management, please visit: <https://ivybusiness.iastate.edu/degree/supply-chain-management/>

## Student Learning Outcomes

Upon graduation, undergraduate students majoring in Supply Chain Management will:

1. Be effective communicators
2. Be effective collaborators
3. Be problem solvers
4. Understand business concepts
5. Recognize ethical and legal responsibilities to organizations

## Curriculum:

In addition to the basic business degree requirements (<https://catalog.iastate.edu/collegeofbusiness/#curriculuminbusinesstext>), Supply Chain Management majors must also complete:

Required Courses (15 credits):

SCM 424	Process Management, Analysis, and Improvement	3
SCM 453	Supply Chain Planning and Control	3
SCM 460	Decision Tools for Logistics and Operations Management	3
SCM 461	Principles of Transportation	3
SCM 486	Principles of Purchasing and Supply Management	3

Elective Courses (3 credits):

Select one elective from the following list:		
SCM 340	Project Management	3
SCM 428	Special Topics in Operations Management *	3
SCM 430	Supply Chain Analytics	3
SCM 434X	Implementing Process Improvement *	3
SCM 440	Supply Chain Information Systems	3
SCM 450	Enterprise Resource Planning Systems in Supply Chain	3
SCM 462	Transportation Carrier Management	3
SCM 466	Global Trade Management	3
SCM 471	Sustainable Supply Chain Management *	3
SCM 473	War and Peace and Supply Chains	3

SCM 491	International Live Case and Study Tour	3
SCM 495	Executive Analysis and Presentations #	3

\* Courses not offered on a regular basis. Students should consult with their academic advisor about terms of offering.

# Only 3 credits of SCM 495 may count as a Supply Chain Management major choice elective.

The X designation after a course number indicates this is an experimental course offered by the Department. Although in an experimental phase, these courses are open for registration just the same as permanent courses listed in the course catalog and count as elective choices in the major.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

Supply Chain Management, B.S.

*Sample 4-Year Plan (Your plan may differ)*

#### Freshman

Fall	Credits Spring	Credits
BUSAD 102 or 103	1 ECON 102	3
ECON 101	3 STAT 226	3
COM S 113	3 US Diversity#	3
ENGL 150	3 ACCT 284	3
MATH 150	3 SP CM 312	3
LIB 160	1 BUSAD 203	1
	<b>14</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
ACCT 285	3 SCM 461	3
SCM 301	3 Core Business Course	3
MATH 151	3 ACCT 215	3
ENGL 250	3 PHIL 230	3
Natural Science	3 HUM/SOC SCI	3
	<b>15</b>	<b>15</b>

#### Junior

Fall	Credits Spring	Credits
SCM 486	3 SCM 424	3
Core Business Courses	6 SCM 460	3
Global/International Perspective@	3 Core Business Course	3

HUM/SOC SCI	3 Global/International Perspective@	3
	General Elective	3
	<b>15</b>	<b>15</b>

#### Senior

Fall	Credits Spring	Credits
SCM 453	3 SCM Elective	3
Core Business Courses	6 HUM/SOC SCI	3
ENGL 302	3 MGMT 478*	3
General Elective	5 General Electives	6
	<b>17</b>	<b>15</b>

**Total Credits: 122**

@ Courses in these requirements may also be used as Global Perspective.

# US Diversity courses may be used to satisfy HUM/SOC SCI.

\* Must have credit or enrollment in all core courses listed above, except for MGMT 372, plus senior standing, in order to enroll in MGMT 478.

Graduation Requirements:

1. Grade of "C" or higher in at least 30 credits of Core and Major courses.
2. 42 credits of 300+ level courses from a four-year institution.
3. 50% of required Business courses must be earned at ISU.
4. At least 32 credits and the LAST 32 credits must be earned at ISU (exceptions for study abroad and internship may be requested).
5. 122 Credits minimum and a Cumulative GPA of at least 2.00 with no quality point deficiencies.
6. A grade of C or better in ENGL 250 required, and also in one other required ENGL course.
7. All 300-level and higher business credits must be earned at a four-year college.
8. Multiple business **majors** must have at least 15 distinct credits in each of the major requirements; when applicable, one course can be shared between business majors; see your advisor regarding multiple business **degree requirements**.

### Undergraduate Minor in Supply Chain Management

The Department of Supply Chain Management also offers a minor for non-Supply Chain Management majors in the Ivy College of Business. The minor requires 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or

university requirement. Students with declared majors have priority over students with declared minors in courses with space constraints.

Required Courses (6 credits):

SCM 301	Supply Chain Management	3
SCM 486	Principles of Purchasing and Supply Management	3

Elective Courses (9 credits):

Select one elective course from:

SCM 424	Process Management, Analysis, and Improvement
SCM 450	Enterprise Resource Planning Systems in Supply Chain
SCM 453	Supply Chain Planning and Control

Select one elective course from:

SCM 460	Decision Tools for Logistics and Operations Management
SCM 461	Principles of Transportation
SCM 462	Transportation Carrier Management
SCM 466	Global Trade Management
SCM 473	War and Peace and Supply Chains

Select one additional elective course from either section above.

Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

For more information on the undergraduate minor in Supply Chain Management, please visit: <https://ivybusiness.iastate.edu/degree/zminors-and-certificates/>

## Graduate Programs

The Department of Supply Chain Management participates in the full-time and part-time Master of Business Administration (MBA) and in the PhD in Business and Technology programs. The department also participates in the interdepartmental MS in Transportation program.

### Master of Business Administration (MBA)

The MBA program is a 48-credit, non-thesis, non-creative component curriculum. Thirty of the 48 credits are core courses and the remaining 18 are graduate electives. Within the MBA program, students can obtain a specialization in Supply Chain Management or Healthcare Analytics and Operations.

### Student Learning Outcomes

Upon graduation, MBA students will:

1. Demonstrate effective communication skills
2. Effectively lead and work in diverse teams

3. Critically solve business problems
4. Integrate ethical and global perspectives in decision making

For more information about the MBA program with a specialization in Supply Chain Management or Healthcare Management and Operations, please visit: <https://ivybusiness.iastate.edu/mba-full-time-details/>

### Masters in Healthcare Analytics and Operations (MHAO)

Students graduating from the Masters in Healthcare Analytics and Operations program will apply data and appropriate models to analyze operations and supply chains to develop and present actionable insights leading to better outcomes in the healthcare industry. Healthcare analytics uses historical and current data to predict trends and optimize operations, bringing benefits to patients, medical professionals, and healthcare supply chain partners.

For more information about the Masters in Healthcare Analytics and Operations program, please visit: <https://www.ivybusiness.iastate.edu/degree/master-of-healthcare-analytics-and-operations/>

### Double Graduate Degree

The Department of Supply Chain Management participates in one double degree program at the graduate level. Students can simultaneously pursue a double degree in Master of Business Administration (MBA) and Master of Healthcare Analytics and Operations (MHAO). The Double Degree plan allows students to share credits between the degrees. See the Director of Graduate Education for more details on sharing credits.

For more information on the double degree in Master of Business Administration (MBA) and Master of Healthcare Analytics and Operations (MHAO), please visit: <https://www.ivybusiness.iastate.edu/master-programs/>

### Ph.D. in Business and Technology

The PhD in Business and Technology is a 56-credit curriculum (minimum) that culminates in a dissertation. Students may select Supply Chain Management (SCM) as their major area of specialization. The primary objective of the SCM specialization is to prepare students for careers in research universities. The SCM domain is broad and includes the design, development and control of business processes for the conversion of inputs into outputs and distribution of those outputs. The traditional focus of SCM was on integration of processes across multiple functions within the firm—operations management, logistics, and purchasing primarily, with elements of marketing and information systems also included. However, in today's world, with competition across supply chain networks, SCM also involves integrating business processes across firms. Research in this area is therefore interdisciplinary in nature and addresses both intra- and inter-organizational issues.



Ph.D. core curriculum	6
Doctoral seminars and research practicum in the area of specialization	14
Minor area (9 cr.) plus electives (3 cr.)	12
Research methods courses	12
Dissertation	12
<b>Total Credits</b>	<b>56</b>

## Student Learning Outcomes

Upon graduation, PhD students will be able to:

1. Understand and advance knowledge
2. Create knowledge through original research
3. Teach effectively in an institution of higher education

For more information about the PhD program with a specialization in Supply Chain Management, please visit: <https://ivybusiness.iastate.edu/phd/phd-supply-chain/>

## Graduate Certificate

The online graduate certificate in Supply Chain Management will provide foundational concepts and applied technical skills that supply chain professionals need to effectively manage a global supply chain.

The certificate is for working professionals as well as students enrolled in graduate programs who are employed or seeking a career as a business analyst, supply chain analyst, or who want to move into a supply chain position.

For more information about the graduate certificate in Supply Chain Management, please visit: <https://ivybusiness.iastate.edu/scm-certificate/>

# COLLEGE OF DESIGN

Luis Rico-Gutierrez - Dean

Seda McKilligan - Associate Dean for Academic Programs

Kevin Kane - Associate Dean for Research and Outreach

[www.design.iastate.edu/](http://www.design.iastate.edu/) (<http://www.design.iastate.edu/>)

## Objectives of the Curricula in Design

The College of Design is among a small number of comprehensive design schools offering outstanding opportunities for both disciplinary and interdisciplinary education.

The College of Design strives to provide each student with a broad educational background and preparation in a specific design or art discipline. Each program is designed to develop knowledge and appreciation of the physical and cultural environment, to stimulate creative thinking and analysis, and to prepare students for participation in a wide variety of careers.

The college's programs also encompass many opportunities for individualized study and extracurricular activities such as visiting lectures and symposia, workshops, gallery exhibits, practicum and internship programs, field trips, and international study programs.

Graduates of the college are employed in private firms, government, industry, and education, or are self-employed as designers or artists. Opportunities for graduates include careers as architects, landscape architects, community and regional planners, graphic designers, industrial designers, interior designers, studio artists, arts administrators and environmental designers.

## Organization of Curricula

All undergraduate programs in the College of Design share a common foundation curriculum, the Core Design Program, followed by degree-specific curricula. The Core Design Program grounds the undergraduate degree programs and provides a rich, rigorous, inclusive base for the college's professional and non-professional programs. It creates a shared language, experience, and community for programs, faculty, and students and exposes students to all design disciplines, allowing them to make more informed degree choices, apply to multiple degree programs, and experiment with interdisciplinary work.

The intense, discipline-specific professional curricula that follow the Core Design Program focus on developing students' ability and knowledge in their major. Within the major area, students advance creative and professional skills through classroom and studio work, critiques of student projects, discussion with professional practitioners, and field studies.

General education, contained in both the Core Design Program and the degree programs, is composed to ensure that students receive a well-rounded undergraduate education.

## High School Preparation

Courses in fine arts and design that develop visualization and freehand drawing abilities are highly recommended, though not required for entrance. Students planning to enroll in an academic program in the College of Design must complete the following high school requirements:

- 4 years of English, including coursework in composition and literature and up to 1 year of speech and/or journalism, to develop communication skills and critical reading/writing ability
- 3 years of mathematics to develop problem-solving skills, including 1 year each of algebra, geometry, and advanced algebra
- 3 years of science, including at least two of the following:
  - 1 year of biology, 1 year of chemistry, or 1 year of physics
- 2 years of social studies, including at least 1 year of U.S. history and 1 semester of U.S. government

## Admission Standards to Enrollment-Managed Professional Programs

Admission into the enrollment-managed professional programs of Architecture, Graphic Design, Industrial Design, Integrated Studio Arts, Interior Design, and Landscape Architecture requires a separate application after completing the Core Design Program.

Students may apply directly to the professional program in Community and Regional Planning and to the programs in Art and Design and Interdisciplinary Design. Transfer students from two-year institutions also may apply to these three programs.

## Advising

Each student receives personal assistance from an academic advisor within the student's curriculum area. Students enrolled in the college's Core Design Program are advised by professional advisors. Once admitted to professional programs, students are assigned to faculty advisors within the student's curriculum area. Advisors help students develop a program of study and access pertinent university resources, and provide information on career choice.

The college's career services office works with students to develop their career goals as well as prepare and search for employment.

## Honors Program

The College of Design participates in the Honors Program, which provides opportunities for outstanding students to individualize their programs of study. Honors students in the College of Design will work with the Honors Program chair or Honors academic advisor to choose from academic and co-curricular experiences that offer breadth and depth in their learning, as well as opportunities for personal, community, and professional development.

See Honors Program.

Departments of the College

- Architecture
- Art and Visual Culture
- Community and Regional Planning
- Graphic Design
- Industrial Design
- Interior Design
- Landscape Architecture

Requirements in the College of Design

All students in the College of Design are expected to meet the following requirements.

Core Design Program

Cr. Fall/Spring

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar *	1
DSN S 131	Drawing I	4
DSN S 183	Design in Context	3
Social Science/Humanities Electives **		6
Math/Science Electives ***		6
Communications		7

- \* Students enrolled in the Design Exchange Learning Community take DSN S 110 in place of DSN S 115.
- \*\* General education credits in the Core Design Program may count toward the minimum credits.
- \*\*\* Students who intend to apply to the Architecture program are strongly advised to take MATH 145 Applied Trigonometry and PHYS 131 General Physics I, PHYS 131L General Physics I Laboratory during their Core year. While these specific courses are not required to apply to the program, they are required to advance in the B.Arch. program beyond the first semester.
- Students who intend to apply to the Industrial Design program are advised to take PHYS 101 Physics for the Nonscientist Physics for the Nonscientist, ECON 101 Principles of Microeconomics Principles of Microeconomics, and a math course during their Core year.

General Education  
International Perspective: 3 cr.  
U.S. Diversity: 3 cr.  
Communications: 7 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3

LIB 160	Introduction to College Level Research	1
Total Credits		7

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 150 and 250 (or ENGL 250H).

**Mathematics, physical sciences, and biological sciences 6 cr.**  
Includes courses in the fields of agronomy, astronomy and astrophysics, biology, chemistry, civil engineering, computer science, geology, mathematics, physics, and statistics.

**Humanities: 6 cr.**  
Includes courses in the fields of classical studies, English (literature), foreign languages, history, philosophy, religious studies, as well as history/theory/literature courses in dance, music, theater, journalism, African American studies, American Indian studies, environmental studies, Latino/a studies, women's studies, and university studies.

**Social Sciences: 6 cr.**  
Includes courses in the fields of African American studies, American Indian studies, anthropology, economics, environmental studies, geography, human development and family studies, Latino/a studies, psychology and sociology, women's studies, and university studies.

**General Education Electives: 9 cr.**  
9 cr. from any of the above areas, 6 cr. of course level 300-400.

Undergraduate Programs  
Majors

- Art and Design
- Architecture
- Community and Regional Planning
- Graphic Design
- Industrial Design
- Integrated Studio Arts
- Interior Design
- Landscape Architecture
- Biological/Pre-Medical Illustration (BPM I)\*

\*The College of Design participates in this interdepartmental major.

Secondary Majors

- Environmental Studies\*\*
- Interdisciplinary Design
- International Studies\*\*

## Minors

- Critical Studies in Design
- Design Studies
- Digital Media
- Entrepreneurial Studies\*\*
- Environmental Studies\*\*
- Geographic Information Science\*\*
- Gerontology\*\*
- Illustration
- International Studies\*\*
- Preservation and Cultural Heritage
- Sustainability\*\*
- Textile Design\*\*
- Urban Studies\*\*

\*\*The College of Design participates in these interdepartmental secondary majors and minors.

## Minors in Design

The College of Design offers or participates in the following undergraduate minors:

- Critical Studies in Design
- Design Studies
- Digital Media
- Entrepreneurship
- Geographic Information Science (GIS)
- Illustration
- Preservation and Cultural Heritage
- Textile Design
- Urban Studies

## Critical Studies in Design

The undergraduate minor in Critical Studies in Design offers students opportunities to engage the history, theory and criticism of visual and material culture and the built environment. In lectures and focused seminars, students explore:

- historical and contemporary issues
- cultural production
- media and technology
- design in everyday life
- models of professional practice

Open to undergraduates in all university majors, this minor requires 15 credits of coursework. At least 6 of the 15 credits must be taken at Iowa State University in courses numbered 300 or above. At least 9 of the

15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

### Requirements:

ART H 292	Introduction to Visual Culture Studies	3
DSN S 183	Design in Context	3
or ARCH 220	Contemporary Architecture	
or ARCH 221	Histories and Theories of Architecture to 1750	
or ART H 280	History of Art I	
or ART H 281	History of Art II	
or C R P 291	World Cities and Globalization	
or C R P 293	Environmental Planning	
9 credits from approved list (at least 6 credits at 300-level or above)		9
<b>Total Credits</b>		<b>15</b>

## Design Studies

The undergraduate minor in Design Studies is constructed to facilitate design awareness among interested students and to provide a vehicle for interdisciplinary study within the College of Design. This minor is open to all undergraduate students at Iowa State University.

This minor requires 15 credits of course work: three (3) credits selected from College of Design history/theory course offerings (DSN S 183 will not meet this requirement) and additional 12 credits selected from any College of Design course offerings\*.

At least 6 of the 15 credits must be taken at Iowa State University in courses numbered 300 or above. At least 9 of the 15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

Students enrolled in the College of Design may not use courses required in their major degree programs or in the Core Design Program to satisfy this minor.

\* The following courses **cannot** be used to meet the requirements for the Design Studies Minor: DSN S 110, 111, 115, 301, 373, 397, 492.

## Digital Media

Manipulation of digital media has emerged as an essential skill for design inquiry alongside traditional methods of building models and drawing sketches. To familiarize students with the use of digital media in the design process, the College of Design offers an undergraduate Minor in Digital Media. This minor is open to all undergraduate students at Iowa State University.

This minor requires 15 credits of coursework. At least three (3) credits of fundamental courses at the 200 level must be taken in the student's primary major (see list below). At least 9 of the 15 credits must be taken

at Iowa State University in courses numbered 300 or above and may not be used to meet any other department, college, or university requirement.

Fundamental Courses:

ARCH 230	Design Communications I (for Architecture majors)	3
ARTGR 275	Graphic Technology I (prereq: ARTGR 270; for Graphic Design majors)	3
ARTGR 276	Graphic Technology II (for Graphic Design majors)	3
ARTID 263	Graphic Communication for Interior Design II (prereq: ARTID 261; for Interior Design majors)	3
ARTIS 212	Studio Fundamentals: Digital Media (for Integrated Studio Arts and all majors)	3
ARTIS 227	Introduction to Creative Digital Photography (for Integrated Studio Arts majors)	3
C R P 251	Fundamentals of Geographic Information Systems (for non-design majors)	3
DSN S 232	Digital Design Communications (for non-design majors)	3
L A 211	Digital Design Methods for Landscape Architecture (for Landscape Architecture and all majors)	3

Entrepreneurial Studies

The College of Design is an active participant in the Entrepreneurial Studies Minor for undergraduate students.

Geographic Information Science (GISC)

The undergraduate minor in Geographic Information Science (GISC) is an interdisciplinary program that provides students with opportunities to engage the theory, processes, techniques and tools that use spatial data and computational technology to create cutting-edge analysis and mapping approaches for a wide range of fields, such as urban planning, architecture, landscape architecture, design, community development, agriculture, environmental sciences, natural resources, sociology, criminology, anthropology, political science, environmental studies and others.

The minor is open to undergraduates in all university majors with a minimum overall GPA of 2.0 prior to enrolling.

Students must complete a minimum of 15 undergraduate credits of GIS coursework to receive the minor. At least 6 of the 15 credits must be taken at Iowa State University in courses numbered 300 or above with a grade of C or higher. At least 9 of the 15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

Requirements:

Foundations of GIS - complete the following 2 courses:		6
C R P 251	Fundamentals of Geographic Information Systems	
C R P 351	Intermediate Geographic Information Systems	

GIS Tools and Techniques - choose 3 courses from the following:		9
A B E 437	Watershed Modeling and Policy	
C R P 449	Geodesign: Planning for Sustainable Futures	
C R P 452	Geographic Data Management and Planning Analysis	
C R P 454	Fundamentals of Remote Sensing and Spatial Analysis (or substitute GEOL 489: Survey of Remote Sensing Technologies)	
C R P 456	GIS Programming and Automation	
C R P 457	Geogames for Civic Engagement	
GEOL 452	Intro GIS for Geoscientists	
GEOL 468	Applied Geostatistics for Geoscientists	
GEOL 488	Raster GIS for Geoscientists	
NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	
NREM 446	Integrating GPS and GIS for Natural Resource Management	

Total Credits	15
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Illustration

The undergraduate minor in Illustration is ideal for students interested in illustration for books, graphic novels, magazine articles, advertising and concept art for game design and film. This minor provides the ability to tailor a curriculum that serves these varied career interests, whether you want to work in the industry or freelance as an independent studio practitioner.

Through this minor, students will:

- develop conceptual skills directed toward communicating narrative content in sequential visual form
- demonstrate the ability for critical thinking through visual, verbal and written communication
- develop technical skills, working with a range of both traditional and digital media used in the field of illustration
- develop an awareness of historical and contemporary illustration
- strengthen individual portfolios to position themselves for success in their chosen field after graduation

Requirements:

Students must complete two prerequisites prior to pursuing the Illustration minor.

Prerequisites:

DSN S 131	Drawing I	4
ARTIS 230	Drawing II	3

After completion of the prerequisites, students must complete a minimum of 15 credits of Illustration coursework to receive the minor. At least 9 of the 15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

Required Courses:	6
ARTIS 330	Drawing III: Life Drawing
ARTIS 432	Sequential Narrative Drawing
Elective Courses:	9
ARTGR 464	Digital Imaging
ART H 489	History of Comics
ARTIS 233	Watercolor Painting
ARTIS 308	Computer Modeling, Rendering and Virtual Photography
ARTIS 338	Painting II
ARTIS 356	Relief Printmaking: Digital/Traditional
ARTIS 357	Intaglio and Monotype Printmaking: Digital / Traditional
ARTIS 358	Lithography: Digital / Traditional
ARTIS 408	Principles of 3D Animation
ARTIS 430	Drawing IV
ARTIS 438	Painting III
ARTIS 490F	Independent Study: Illustration
BPM I 323	Scientific Illustration Principles and Techniques or ARTIS 323Scientific Illustration Principles and Techniques
BPM I 326	Illustration and Illustration Software or ARTIS 326Illustration and Illustration Software
BPM I 327	Illustration as Communication or ARTIS 327Illustration as Communication
BPM I 337	Application of Scientific Illustration Techniques or ARTIS 337Application of Scientific Illustration Techniques

## Preservation and Cultural Heritage

The undergraduate minor in Preservation and Cultural Heritage provides students with knowledge, skills, and credentials that complement undergraduate degrees in a wide variety of majors, but especially Architecture, Interior Design, Community & Regional Planning, Landscape Architecture, and History. To these ends, the Minor has two major curricular objectives:

- Provide student with a holistic understanding of historic preservation that draws from the various departments involved, yet allows for the development of expertise within a student's specific major.
- Provide a curriculum that conforms with the National Council for Preservation Education's pedagogical guidelines and the Federal

government's Professional Qualification Standards for historic preservation under 36 Code of Federal Regulations (CFR) Part 61.

The minor requires a minimum of 15 credit hours. At least six (6) credits need to be taken at the 300 or above (see list below), and at least 9 of the 15 credits must not be used to meet any other department, college or university requirement except the credit requirement for graduation.

For more information go to <https://www.preservation.design.iastate.edu/pch-undergraduate-minor/>

For any questions, please send an email to [historicplaces@iastate.edu](mailto:historicplaces@iastate.edu)

### Preservation & Cultural Heritage Minor Curriculum:

The Minor requirements are divided into three sections (see below).

Please choose six (6) credits from **Section 1 (Preservation Courses)**, three (3) credits from **Section 2 (General History)**, and six (6) credits from **Section 3 (History and Design of the Built Environment)**.

Section 1: Preservation Courses (choose two of the following)	6
ARCH 567	Preservation, Restoration, Rehabilitation, Cultural Heritage, and Technology
ARCH 568	Historic Preservation
ARTID 572	Preservation & Cultural Heritage
C R P 511	Documenting the Historic Built Environment
Section 2: General History (choose one of the following)	3
ART H 383	Greek and Roman Art
ART H 384	Art of Islam
ART H 385	Renaissance Art
ART H 386	American Art to 1945
HIST 307	American Popular Culture
HIST 320	History of Modern Europe, 1789 to Present
HIST 362	Global Environmental History
HIST 363	U. S. Environmental History
HIST 386	History of Women in America
HIST 468	History of Rural America
HIST 488	American Stuff, Colonial Times to the Present
Section 3: History, Design, and Planning of the Built Environment (choose two courses or one studio)	6

One of the two courses can be an independent study course that students can take with faculty teaching courses in the Minor in Preservation & Cultural Heritage Program

ARCH 221	Histories and Theories of Architecture to 1750
ARCH 322	Histories and Theories of Architecture after 1750
ART H 280	History of Art I
ART H 281	History of Art II
ART H 597	Green Art: Earthworks and Beyond
ARTID 355	Interior Design History/Theory/Criticism I



ARTID 356	Interior Design History/Theory/Criticism II
C R P 421	Financing Historic Preservation Projects
C R P 521	Historic Preservation Planning: Theory and Practice
DSN S 546	Interdisciplinary Design Studio
IND D 380	History and Culture of Objects
L A 371	History of Modern Landscapes, 1750 to Present
L A 373	Gardens and Landscapes from Antiquity to 1750

## Textile Design

The undergraduate minor in Textile Design allows students to focus specifically on the design and creation of textiles - a practice with applications in the fine arts, fashion and related fields. Open to undergraduates at the sophomore level and above enrolled in any College of Design major or in the Apparel, Merchandising and Design major in the College of Human Sciences.

Through this minor, students will:

- learn historical and contemporary applications of textile production
- develop conceptual skills in textile media and techniques such as printing, dyeing and weaving for self-expression
- develop technical skills in both hand skills and digital tools
- demonstrate the ability for critical thinking through visual, verbal and written communications with an emphasis on what it means to be an artist/designer using textile media and techniques
- strengthen individual portfolios to position themselves for success in their chosen field after graduation

Students must complete 16-18 credits of Textile Design coursework to receive the minor. At least 9 of the 15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

### Requirements:

Required Core	6
A M D 204	Textile Science
ARTIS 214	Studio Fundamentals: Textiles
History/Theory (choose one of the following)	3
A M D 362	Cultural Perspectives of Global Dress
ART H 280	History of Art I
ART H 281	History of Art II
ART H 292	Introduction to Visual Culture Studies
Practice (choose two of the following)	6
A M D 121	Apparel Assembly Processes
A M D 328	Apparel, Merchandising, and Design Seminar
A M D 490	Independent Study

ARTIS 208	Color
ARTIS 345	Introduction to Weaving
ARTIS 346	Natural Dyes
ARTIS 347	Dyed and Printed Textiles
ARTIS 448	Digital Textile Design
ARTIS 490E	Independent Study: Textiles
Electives (choose from the following)	3-5
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century
A M D 356	Euro-American Dress History: Mid-19th Century to the Present
ARTIS 206	Studio Fundamentals: Printmaking
ARTIS 213	Studio Fundamentals: Painting
ARTIS 310	Sources and Methods of Visual Art
ART H 382	Art and Architecture of Asia
ART H 384	Art of Islam
DSN S 131	Drawing I

## Urban Studies

The undergraduate minor in Urban Studies is an interdisciplinary program that emphasizes urban life in a variety of settings and from different disciplinary and methodological approaches. The Urban Studies minor will allow students to explore varied and multiple dimensions of urban and community life through differing conceptual and analytical frameworks. Students can pursue interests in:

- urban history
- urban design
- neighborhood revitalization
- economic development
- social movements
- global urbanization

The minor is open to undergraduates in all university majors except Community & Regional Planning.

This minor requires 15 credit hours of coursework. At least 6 of the 15 credits must be taken at Iowa State University in courses numbered 300 or above. At least 9 of the 15 credits must not be used to meet any other department, college or university requirements except the credit requirement for graduation.

### Requirements:

C R P 201	The North American Metropolis	3
C R P 291	World Cities and Globalization	3
Nine (9) credits in three other courses from the approved list **		9
<b>Total Credits</b>		<b>15</b>

\*\* Approved list of elective courses for Urban Studies Minor (<https://www.design.iastate.edu/programs-minors/minors/urban-studies/>)

## Graduate Programs

The College of Design offers graduate study in the areas shown below. Graduate study is conducted through the Graduate College. Details are found in the Graduate College section of this catalog.

### Majors

- Architecture
- Community and Regional Planning
- Graphic Design
- Industrial Design
- Integrated Visual Arts
- Interior Design
- Landscape Architecture
- Sustainable Environments\*
- Transportation\*
- Urban Design\*

### Double Degree Programs

- Architecture / Business Administration
- Architecture / Community and Regional Planning
- Architecture / Sustainable Environments
- Architecture / Urban Design
- Community and Regional Planning / Business Administration
- Community and Regional Planning / Landscape Architecture
- Community and Regional Planning / Sustainable Agriculture
- Community and Regional Planning / Sustainable Environments
- Community and Regional Planning / Urban Design
- Industrial Design / Human Computer Interaction (HCI)
- Integrated Visual Arts / Sustainable Environments
- Landscape Architecture / Sustainable Environments
- Landscape Architecture / Urban Design

### Certificates

- Geographic Information Systems (GIS)
- Gerontology\*
- Preservation and Cultural Heritage

\* The College of Design participates in this interdepartmental graduate program.

## Architecture OVERVIEW

<http://www.design.iastate.edu/architecture> (<https://www.design.iastate.edu/architecture/>)

The Department of Architecture is committed to the study of architecture as a cultural discipline in which issues of practice, of the multiplicity of social formations in which buildings exist, and of environmental effects are integrated with building design through construction, space, material, form and use. Architecture arises from the aspirations that diverse individuals and groups have for their physical environment, and from the social enterprise of designing and fabricating the landscape we inhabit. It involves individual and multiple buildings, the spaces within them, and the exterior landscape.

The undergraduate program in architecture is an accredited 165-credit five-year undergraduate professional program, including the 31-credit Core Design Program, leading to the Bachelor of Architecture degree (B. Arch). The program provides opportunities for general education as well as preparation for professional practice and/or graduate study. An optional one-semester foreign study program is offered to fourth-year students. Other study abroad opportunities are also available for short-term and semester-long duration.

The undergraduate curriculum includes one year of the college's Core Design Program followed by a four-year professional program. Admission to the professional degree program is based on the applicant's performance in the completed pre-professional curriculum; previous high school record (or transfer record where applicable); portfolio and essay evaluations; and on available departmental resources. Information on admission criteria is posted each year on the College of Design website.

Students completing their Bachelor's degree may opt to include a wide range of minor option as part of their course of study. A number of minors related to design, including digital media, critical studies, urban studies, and sustainability, can be integrated within their regular course of study; for details, please refer to the College of Design website.

For students entering the professional program after completion of the Core Design Program, the department requires purchase on their own or through the college of a laptop/notebook computer and appropriate software. Information is provided to students about computer requirements at the time of acceptance to the program.

The department offers two graduate degrees in architecture: a 90-credit graduate professional program leading to the Master of Architecture (M.Arch.) and a 30-credit interdisciplinary graduate program leading to the Master of Science in Architecture (M.S. Arch.). Both degrees offer options for interdisciplinary study within the College of Design and across related fields within the university. Double-degree programs are offered

with a number of other graduate programs of study within the college. Financial support in the form of teaching and research assistantships is available competitively.

Students who complete their Bachelor of Architecture Degree at Iowa State University may have 6 approved credit hours of their undergraduate study applied towards their Graduate Standing, permitting them to complete the M.S.Arch with 24 additional credit hours of study. In addition to graduate studies in Architecture, Bachelor of Architecture students may opt to pursue a one-year program of Master's studies from other departments or programs in the College and the University. For complete current graduate program descriptions (many of which can apply 6 transfer credits from undergrad study), please see the College website under Graduate Programs.

Student Learning Outcomes

Our program prepares students for careers in architecture and related disciplines, emphasizing a diverse and holistic approach whereby graduates obtain:

- Rigorous, research-driven, and creative design skills;
- A broad, inclusive, and nuanced appreciation for the historic and theoretical frameworks that inform practice today;
- An array of graphic, computational and presentation skills needed to both design and convey design intent;
- An understanding of contemporary technical and performance criteria used to model, analyze, and construct projects, so as to responsibly evaluate the technical and environmental impact of design decisions; and
- A grounding in the critical, aesthetic, and ethical role of the profession and its relationship to public health, safety, well-being, and environmental stewardship.

Program Accreditation

Iowa State University Department of Architecture offers programs accredited by the National Architectural Accrediting Board, which requires the inclusion of the following statement:

"In the United States, most registration boards require a degree from an accredited professional degree program as a prerequisite for licensure. The National Architectural Accrediting Board (NAAB), which is the sole agency authorized to accredit professional degree programs in architecture offered by institutions with U.S. regional accreditation, recognizes three types of degrees: the Bachelor of Architecture, the Master of Architecture, and the Doctor of Architecture. A program may be granted an eight-year term, an eight-year term with conditions, or a two-year term of continuing accreditation, or a three-year term of initial accreditation, depending on the extent of its conformance with established education standards.

Doctor of Architecture and Master of Architecture degree programs may require a nonaccredited undergraduate degree in architecture for admission. However, the non-accredited degree is not, by itself, recognized as an accredited degree."

Iowa State University Department of Architecture offers the following NAAB-accredited degree programs:

- Bachelor of Architecture (165 cr.)
- Master of Architecture (90 cr.; prerequisite: undergraduate degree in a discipline other than architecture or a four-year pre-professional degree in architecture)

Degree Requirements

Total B. Arch. Requirement: 165 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

International Perspective: 3 cr.

U.S. Diversity: 3 cr.

Communications: 7 cr.

(C or better grade in ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
Total Credits		7

Humanities: 6 cr.

6 cr. from approved list.

Social Sciences: 6 cr.

6 cr. from approved list.

Math and Physical Sciences: 8 cr.

MATH 145	Applied Trigonometry	3
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
Total Credits		8

Design Core 13 cr.

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
Total Credits		13

**Design Communications: 6 cr.**

ARCH 230	Design Communications I	3
ARCH 231	Advanced Design Representation	3
<b>Total Credits</b>		<b>6</b>

**Design: 48 cr.**

ARCH 201	Architectural Design I	6
ARCH 202	Architectural Design II	6
ARCH 301	Architectural Design III	6
ARCH 302	Architectural Design IV	6
ARCH 401	Architectural Design V	6
ARCH 402	Architectural Design VI	6
ARCH 403	Architectural Design VII	6
DSN S 546	Interdisciplinary Design Studio	6
<b>Total Credits</b>		<b>48</b>

**Building Technologies: 21 cr.**

ARCH 345	Building Science and Technology I	2
ARCH 345L	Building Science and Technology I Lab	1
ARCH 346	Building Science and Technology II	3
ARCH 346L	Building Science and Technology II Lab	2
ARCH 347	Building Science and Technology III	3
ARCH 347L	Building Science and Technology III Lab	2
ARCH 348	Building Science and Technology IV	3
ARCH 348L	Building Science and Technology IV Lab	2
ARCH 445	Building Science and Technology V	2
ARCH 445L	Building Science and Technology V Lab	1
<b>Total Credits</b>		<b>21</b>

**Studies in History, Theory, and Culture: 18 cr.**

ARCH 220	Contemporary Architecture	3
ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 322	Histories and Theories of Architecture after 1750	3
Nine credits from approved HTC Option list.		9
<b>Total Credits</b>		<b>18</b>

**Behavioral Studies/Practice: 6 cr.**

ARCH 371	Human Behavior and Environmental Theory	3
ARCH 482	Professional Practice	3
<b>Total Credits</b>		<b>6</b>

**Professional Options: 9 cr.**

6 cr. 300-500 level Arch; 3 cr. from Arch, Art, Art H, ArtID, ArtGr, ArtIS, C R P, Des, Dsn S, or L A, SusE, or Urb D.

**Electives: 17 cr.**

2 cr. Kin or Ath allowed; 4 cr. AFAS, M S, or N S allowed; 9 cr. Arch allowed (no P/NP).

Architecture, B.Arch.

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
DSN S 102 or 131	4 DSN S 102 or 131	4
DSN S 110 or 115	1 DSN S 183 or ENGL 150	3
DSN S 183 (or General Elective)	3 PHYS 131	4
DSN S 132	1 PHYS 131L	1
ENGL 150 or LIB 160 (or General Elective)	1-3 Social Science/Humanities Elective	3
MATH 145	3 LIB 160 or ENGL 250*	1-3
Social Science/Humanities Elective	3 *LIB 160 is taken once.	

**16-18**

**16-18**

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ARCH 201	6 ARCH 202	6
ARCH 220	3 ARCH 346	3
ARCH 230	3 ARCH 346L	2
ARCH 345	2 ARCH 371	3
ARCH 345L	1 ARCH 231	3
ENGL 250*	3	

\*If not taken the first year.

**18**

**17**

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ARCH 221	3 ARCH 302	6
ARCH 301	6 ARCH 322	3
ARCH 347	3 ARCH 348	3
ARCH 347L	2 ARCH 348L	2
Social Sciences/Humanities Elective	3 HTC Elective	3

**17**

**17**

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ARCH 401	6 ARCH 402	6
ARCH 445	2 HTC Elective	3
ARCH 445L	1 General Elective	3
ARCH 482	3 General Elective	3

HTC Elective	3	
Social Science/Humanities Elective	3	
	<b>18</b>	<b>15</b>
<b>Fifth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ARCH 403	6 DSN S 546	6
Professional Elective	3 Professional Elective	3
Professional Elective	3 General Elective	3
General Elective	3 General Elective	2
	<b>15</b>	<b>14</b>

Total Credits: 165

Admission into the Bachelor of Architecture Program requires the completion of the Core Design Program. Admission depends upon available resources; admission criteria are posted on the College of Design website. Transfer students are considered on a case-by-case basis.

## Graduate Programs

### Master of Architecture (M.Arch.)

Our 90-credit M.Arch. is an accredited professional degree in architecture designed for students with undergraduate degrees in disciplines other than architecture as well as for students who hold a four-year pre-professional degree in architecture. Applicants holding B.S. or B.A. degrees in Architecture or other affiliated design fields may be given advanced standing in the M.Arch. program.

The M.Arch. program engages with architecture as a form of knowledge, practice and production situated in relation to contemporary concerns and issues. Students gain the knowledge, skills and experience with which to professionally practice architecture, while also developing a critical awareness of the discipline's wider social, political, economic, environmental and cultural implications.

M.Arch. is accredited by the National Architectural Accreditation Board (NAAB) and leads to a professional Master of Architecture degree over three years. The curriculum commences with an intensive sequence of classes that establish the foundations for the study and practice of architecture. Equal emphasis is placed on each of the three study areas: studios in architectural design and media, laboratories and lectures on science and technology, and lectures and seminars on history and theory. Building on these foundations, students are supported in developing their own particular interests and agendas as they progress through the subsequent two years of study. This is facilitated through options in

studying abroad, undertaking specialized studio options both within and outside of the department, and opportunities for independent study.

In addition to architecture, students previously admitted to the full three-year program have held undergraduate degrees in a broad range of fields, including art history, history, literature, interior design, economics, mathematics, computer science, anthropology, medicine and philosophy. This diverse range of previous study and experience is brought to bear on the study of architecture, collectively enriching the range and depth of our program.

While students with undergraduate degrees in other disciplines, must complete the full three years of the curriculum, students with undergraduate degrees in architecture or other related design fields may, on consideration, be given advanced standing in the program. Advanced standing students may waive up to the whole first year.

### Master of Architecture (M.Arch.)

#### Studio Courses: 36 cr.

ARCH 505	Architectural Design and Media I: Mapping, Programming, Building	6
ARCH 506	Architectural Design and Media II: Materiality and Representation	6
ARCH 601	Sustainable Building Design	6
ARCH 602	Communities, Architecture and the Environment	6
ARCH 603	Integrative Design	6
ARCH 604	Design Studio Options	6

#### Technology and Practice: 18 cr.

ARCH 543	Building Science and Technology I	6
ARCH 544	Building Science and Technology II	3
ARCH 582	Professional Practice	3
ARCH 641	Building Science and Technology III	3
ARCH 642	Building Science and Technology IV	3

#### History and Theory: 12 cr.

ARCH 595	Seminar on the Built Environment I: History	3
ARCH 596	Seminar on the Built Environment II: Landscape and Society	3
ARCH 597	Seminar on the Built Environment III: Theory	3
ARCH 598	Seminar on the Built Environment IV: Topical Study	3

#### Electives: 24 cr.

Total Credits: 90

### Master of Science in Architecture (M.S.)

M.S. in Arch. is a 30-credit research degree with a required graduate thesis. As a research degree, this program is not subject to NAAB accreditation.

M.S. in Arch. is open for applicants who hold a professional degree in architecture or other related design fields. Applicants are required to submit a research proposal that lies within one of the study areas listed on the program's webpage. The degree is also open for applicants with non-professional degrees in various fields depending on the research proposed by the applicant.

### Master of Science In Architecture (M.s.)

#### History and Theory: 6 cr. (Choose two seminars from this list)

ARCH 595	Seminar on the Built Environment I: History	3
ARCH 596	Seminar on the Built Environment II: Landscape and Society	3
ARCH 597	Seminar on the Built Environment III: Theory	3
ARCH 598	Seminar on the Built Environment IV: Topical Study	3

#### Thesis: 9 cr.

ARCH 699	Research	9
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#### Area of Study: 9 cr.

#### Electives: 6 cr.

Total Credits: 30

## Dual degree

Double degree programs are offered with a number of graduate programs in other college departments. Information about our programs and how to apply can be obtained from the department's web page at: <https://www.design.iastate.edu/architecture/>

Financial support in the form of teaching and research assistantships is available.

## Art and Design

The Department of Art and Visual Culture offers degree programs focused on fine arts and visual culture, offering courses in studio arts, art history, and art education, and scientific illustration. Degree offerings include the Bachelor of Arts (BA) in Art and Design, Bachelor of Fine Arts (BFA) in Integrated Studio Arts, and Master of Fine Arts (MFA) in Integrated Visual Arts.

The Bachelor of Arts in Art and Design is a four-year degree program with two options: *Art and Culture* or *Visual Culture Studies*. Both options require students to complement their studio art or visual culture studies coursework with study in a second area, within or outside of the College of Design. This can include a second major or minor, or an alternative program of study approved by the student's academic advisor.

Flexibility is a key feature of the BA in Art and Design. Many students, working with an advisor, design a course of study that allows them to pursue the BA degree in conjunction with a second major or minor such as journalism, advertising, business, entrepreneurship, history, or psychology.

The BA in Art and Design can serve as a springboard into a wide array of exciting graduate school and career opportunities, including art criticism, art history, art sales, conservation, corporate art collections, gallery/museum studies, and art therapy.

### Art and Culture Option (Fine Arts + another area of interest)

In the Art and Culture option, students combine coursework in studio art with another area of interest. Working with an advisor, students design their own programs of study, which may include another major or minor in addition to the concentration emphasizing studio art.

### Visual Culture Studies Option (Art History + another area of interest)

The Visual Culture Studies option is for students seeking a concentrated course of study in art and design history, theory, and criticism. For students interested in museum studies, courses may include up to nine (9) credits of museum or gallery internship. Working with an advisor, students design their own programs of study, which may include another major or minor in addition to the concentration in visual culture studies. Required courses include six (6) history courses at the 300/400 level.

## Student Learning Outcomes

Students will learn to:

- develop creative problem-solving abilities and traditional and innovative technical skills through the design, research, and creative processes;
- understand and express in multiple media the relationship between objects, aesthetics, and meaning;
- exhibit an awareness of their roles as artists and thinkers regarding the ethical, cultural, and ecological impacts of what they do;
- express through visual, verbal, and written means an awareness of global art movements and a meaningful understanding of historic and contemporary art; and
- use their understanding and practice of art to engage with local, national, and global communities where they can participate in broad exchange of ideas.

This curriculum offers two concentrations: *Art and Culture* and *Visual Culture Studies*. Both concentrations are combined with an approved program of study, which may consist of a second major or a minor.

### Art and Culture Concentration

The curriculum in Art and Design: Art and Culture Concentration leads to a 122-123 credit undergraduate Bachelor of Arts degree.



**Total Degree Requirements: 122-123 credits**

Only 65 credits from a two-year institution can apply, and may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

**International Perspectives: 3 credits****U.S. Diversity: 3 credits****Communication: 10 credits**

(C or better grade in ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One course from the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 110	Listening	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>10</b>

**Humanities: 6 credits**

6 credits from College of Design General Education Approved Course List

**Social Sciences: 6 credits**

6 credits from College of Design General Education Approved Course List

**Math/Physics/Biol. Sciences: 6 credits**

6 credits from College of Design General Education Approved Course List

**General Education Courses: 9 credits**

6 credits at level 300-400 from College of Design General Education Approved Course List

3 credits from College of Design General Education Approved Course List	3
<b>Total Credits</b>	<b>9</b>

**College of Design Core: 13 credits**

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>13</b>

**Art History and Theory: 15 credits**

ART H 280	History of Art I	3
ART H 281	History of Art II	3
Six credits from 300-level or above from ART H		6

Three credits from courses in ART H, or approved history courses in ARCH, CRP, or LA	3
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<b>Total Credits</b>	<b>15</b>
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**Art and Culture Concentration: 12 credits**

12 credits from 200-level or above in College of Design studio courses.

**Program of Study: 30 credits**

30 credits from an approved program of study, including 6 credits at 300-400 level.

**Electives: 15 credits****Visual Culture Studies Concentration****Total Degree Requirements: 121-122 credits**

Only 65 credits from a two-year institution can apply and may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

**International Perspectives: 3 credits****U.S. Diversity: 3 credits****Communication: 10 credits**

(C or better grade)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One course from the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 110	Listening	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>10</b>

**Humanities: 6 credits**

6 credits from College of Design General Education Approved Course List

**Social Sciences: 6 credits**

6 credits from College of Design General Education Approved Course List

**Math/Physics/Biol. Sciences: 6 credits**

6 credits from College of Design General Education Approved Course List

**General Education Courses: 9 credits**

6 credits at level 300-400 from College of Design General Education Approved Course List

3 credits from College of Design General Education Approved Course List	3
<b>Total Credits</b>	<b>9</b>

**Visual Culture Studies Core: 9 credits**

ART H 280	History of Art I	3
ART H 281	History of Art II	3
Choose ONE from the following		

DSN S 183	Design in Context	3
or ART H 292	Introduction to Visual Culture Studies	
<b>Total Credits</b>		<b>9</b>

**Visual Culture Studies Concentration: 36 credits**

6 credits foreign language. 27 credits in approved History/Theory/Criticism courses from departments in the College of Design. May include up to 9 credits Museum/Gallery Internship. 12 credits must be at 300 level or above. 3 credits ART H 499 Visual Culture Studies Writing and Methods Seminar.

**Program of Study: 24 credits**

24 credits from an approved program of study, including 6 credits at 300-400 level.

**Electives: 15 credits**

Art and Design, BA, Art and Culture Concentration

**First Year**

Fall	Credits Spring	Credits
DSN S 102 or 131	4 DSN S 131 or 102	4
DSN S 110 or 115	1 DSN S 183 (or General Education)	3
DSN S 132	1 ENGL 150 (or General Education)	3
DSN S 183 (or General Education)	3 General Education	3
ENGL 150 (or General Education)	3 General Education	3
General Education	3 LIB 160	1
General Education	3	
<b>18</b>		<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
Studio Option	3 Studio Option	3
Approved POS	3 Approved POS	3
General Education	3 General Education	3
ART H 280 (fall only)	3 ART H 281 (spring only)	3
ENGL 250 (or General Education)	3 ENGL 250 (or General Education)	3
<b>15</b>		<b>15</b>

**Third Year**

Fall	Credits Spring	Credits
Studio Option	3 Studio Option	3
Approved POS	3 Approved POS	3
Approved POS	3 Approved POS	3
General Education	3 Elective	3

ART H 300-level or above	3 ART H 300-level or above	3
	DSN S 301 (Rome option only)	1
<b>15</b>		<b>16</b>

**Fourth Year**

Fall	Credits Spring	Credits
Approved POS	3 Approved POS	3
Approved POS	3 Approved POS	3
Elective	3 Elective	3
Elective	3 Elective	3
Art History or Design History	3	
<b>15</b>		<b>12</b>

Art and Design, BA, Visual Culture Studies Concentration

**First Year**

Fall	Credits Spring	Credits
ART H 280 (fall only)	3 ART H 281 (spring only)	3
DSN S 183 or ART H 292 (or General Education)	3 DSN S 183 or ART H 292 (or General Education)	3
ENGL 150 (or General Education)	3 ENGL 150 (or General Education)	3
LIB 160	1 General Education	3
General Education	3 General Education	3
General Education	3	
<b>16</b>		<b>15</b>

**Second Year**

Fall	Credits Spring	Credits
Visual Culture Studies Option	3 Visual Culture Studies Option	3
Approved POS	3 Approved POS	3
General Education	3 Approved POS	3
General Education	3 General Education	3
ENGL 250 (or General Education)	3 ENGL 250 (or General Education)	3
<b>15</b>		<b>15</b>

**Third Year**

Fall	Credits Spring	Credits
Visual Culture Studies	3 Visual Culture Studies	3
Language Requirement	Language Requirement	
Visual Culture Studies Option	3 Visual Culture Studies Option	3
Approved POS	3 Approved POS	3
Approved POS	3 Approved POS	3

Elective	3 Elective	3
	DSN S 301 (Rome option only)	1
<b>15</b>		<b>16</b>
<b>Fourth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ART H 499 Visual Culture Studies Writing and Methods Seminar	3 Visual Culture Studies Option	3
Approved POS	3 Approved POS	3
Visual Culture Studies Option	3 Approved POS	3
Elective	3 Elective	3
Elective	3 Elective	3
<b>15</b>		<b>15</b>

## Community and Regional Planning Overview

[www.design.iastate.edu/community-and-regional-planning](http://www.design.iastate.edu/community-and-regional-planning) (<http://www.design.iastate.edu/communityplanning/>)

Community and regional planning is a field of study aimed at understanding the ever-changing socioeconomic and physical environments of our communities and planning for their future. Planners evaluate and seize opportunities to solve problems. Planners work at multiple levels of government, as well as the private sector, and they are concerned with issues that affect every corner of the world: the preservation and enhancement of the quality of life in a community, the protection of the environment, the promotion of equitable economic opportunities; and the management of growth and change of all kinds.

Graduates of the Community and Regional Planning department are able to integrate planning knowledge and skills in a variety of practical applications, and can communicate effectively in written and oral form.

Graduates will be qualified for a variety of entry-level positions in the public, private, and not-for-profit sectors. They will also be well prepared for graduate study in a variety of fields, including urban planning, law, public policy, public health, environmental science, geography, sociology, urban design, historic preservation, data science, and architecture.

Graduates of the Community and Regional Planning department are expected to understand the structure and functions of urban settlements, including the history of planning and urban development and the processes for plan and policy making. Graduates should have skills in problem formulation, quantitative analysis, written/oral and graphic communications, and collaboration, and in synthesizing and applying knowledge to practice. Graduates are expected to be able to assess the

impact of plans and alternatives based on principles of equity and social justice, economic welfare and efficiency, environmental sustainability, and cultural heritage in the context of citizen involvement in decision making.

The department is a member of the Association of Collegiate Schools of Planning. The curriculum is accredited by the Planning Accreditation Board of the American Institute of Certified Planners. Our students gain an education that, when combined with experience, supports eligibility for membership in the American Institute of Certified Planners.

The department administers two undergraduate minors: Urban Studies and Geographic Information Science (GIS). The department cooperates in the undergraduate minors in Design Studies, Digital Media, Critical Studies in Design, Environmental Studies, and Sustainability.

### Student Learning Outcomes

We educate students to be *critical thinkers and engaged global citizens who have the ability to contribute to a better world*. Graduates of the Community and Regional Planning program at Iowa State University will be skilled in understanding and articulating community problems and issues and be able to apply planning knowledge in a diverse and democratic setting, to the standards of conduct outlined by the American Institute of Certified Planners.

Graduates of the program will:

- demonstrate essential knowledge of the purpose and history of planning;
- demonstrate knowledge of planning ethics, equity and social justice and be capable of making sound ethical judgments;
- demonstrate knowledge of planning law and local government institutions regarding how plans and policies are developed and implemented;
- be knowledgeable about the planning process; understand how social, cultural and economic forces influence land use changes; be able to develop alternative scenarios for the future; and have experience applying these ideas through active learning and real life experiences;
- have a working knowledge of both qualitative and quantitative methods and demonstrate their ability to apply these methods in order to analyze a planning problem or situation;
- engage communities, identify a range of tools that can be applied to different situations, and demonstrate their ability to expand participation, ensure inclusion, and give voice to diverse stakeholders;
- demonstrate professional written, oral and visual communication skills within a variety of educational and community settings;
- be knowledgeable about the natural environment and understand the factors that create sustainable and resilient communities;
- be knowledgeable about diverse ideas, cultures and societies; and

- have a basic knowledge about global issues that affect planning, urbanization, and societies.

## Degree Requirements

The Department of Community and Regional Planning administers the 128-credit-hour undergraduate program leading to the Bachelor of Science. Students have the opportunity to work with their faculty advisors to define their own areas of interest, which may include a minor.

The BS in Community and Regional Planning program can be completed in two to four years. Students can declare a major in CRP at any time during their enrollment at Iowa State University. If applying by transfer from another program or institution, admission is based on the student's cumulative GPA and a departmental review of course work. Transfer applications from students in programs in anthropology, sociology, political science, history, geography, engineering, and other related disciplines are encouraged. Community and Regional Planning emphasizes responsibility and citizenship, writing and analytical ability, and critical thinking.

### Total Degree Requirement: 128 credits

Only 65 credits from a two-year institution may apply which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA; completion of all requirements listed below.

#### International Perspective: 3 credits

#### U.S. Diversity: 3 credits

#### Communication: 13 credits

(C or better grade in ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGL 309	Proposal and Report Writing	3
or ENGL 314	Technical Communication	
SP CM 212	Fundamentals of Public Speaking	3
LIB 160	Introduction to College Level Research	1
<b>Total Credits</b>		<b>13</b>

### Humanities: 9 credits; 6 credits 300-level or above

PHIL 201	Introduction to Philosophy	3
or PHIL 206	Introduction to Logic and Scientific Reasoning	
or PHIL 230	Moral Theory and Practice	
Six credits from program curriculum sheet		6
<b>Total Credits</b>		<b>9</b>

### Social Sciences: 18 credits 300 level or above

ECON 101	Principles of Microeconomics	3
or ECON 102	Principles of Macroeconomics	
POL S 111	Introduction to American Government	3

SOC 134	Introduction to Sociology	3
Nine credits from program curriculum sheet.		9
<b>Total Credits</b>		<b>18</b>

### Math/Physics/Biol. Sciences: 13 credits

STAT 101 Principles of Statistics, 6 credits in Natural Sciences, 3 credits in Math

#### Design Core: 3 credits

DSN S 102	Design Studio I	3-4
or DSN S 183	Design in Context	
<b>Total Credits</b>		<b>3-4</b>

### Community and Regional Planning Core: 25 credits

C R P 201	The North American Metropolis	3
C R P 293	Environmental Planning	3
C R P 301	Urban Analytical Methods	4
C R P 383	Theory of the Planning Process	3
C R P 391	Field Travel	1
C R P 432	Community Planning Studio	6
C R P 492	Planning Law, Administration and Implementation	3
C R P 331	Professional Practice Seminar	2
<b>Total Credits</b>		<b>25</b>

### Planning Elective: 24 credits

24 credits from:

C R P 251	Fundamentals of Geographic Information Systems	3
C R P 291	World Cities and Globalization	3
C R P 320	Urban Geography	3
C R P 325	Introduction to Housing	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 376	Rural, Urban and Regional Economics	3
C R P 416	Urban Design and Practice	6
C R P 417	Urban Revitalization	3
C R P 421	Financing Historic Preservation Projects	3
C R P 429	Planning in Developing Countries	3
C R P 435	Planning in Small Towns	3
C R P 436	Community Economic Development	3
C R P 437	Public Participation in Planning	3
C R P 442	Site Development	3
C R P 445	Transportation Policy and Planning	3
C R P 449	Geodesign: Planning for Sustainable Futures	3
C R P 452	Geographic Data Management and Planning Analysis	3
C R P 457	Geogames for Civic Engagement	3

C R P 460	Social Justice and Planning	3
C R P 471	Real Estate Development	3
C R P 455	Smart and Sustainable Cities	3
C R P 479	Public Finance and Planning	3
C R P 484	Sustainable Communities	3
C R P 491	Environmental Law and Planning	3
C R P 494	Senior Seminar in Planning	3
C R P 511	Documenting the Historic Built Environment	3-4
C R P 521	Historic Preservation Planning: Theory and Practice	3

**General Electives: 23 credits**

23 credits of general electives from program curriculum sheet

Community and Regional Planning. B.S.

**First Year**

Fall	Credits Spring	Credits
DSN S 102 or 183	3-4 Math/Science	3
ENGL 150	3 SP CM 212	3
ECON 101 or 102	3 PHIL 201, 206, or 230	3
SOC 134	3 Natural Sciences	3
Elective	3 Elective	3
LIB 160	1	
	<b>16-17</b>	<b>15</b>

**Second Year**

Fall	Credits Spring	Credits
C R P 201	3 C R P 293	3
STAT 101	4 C R P 301	4
ENGL 250	3 C R P 391	1-2
POL S 111	3 Soc. Science/Humanities Elective	6
Humanities Elective	3 Elective	3
	<b>16</b>	<b>17-18</b>

**Third Year**

Fall	Credits Spring	Credits
C R P 492	3 Planning Electives	6
C R P 383	3 Elective	3
ENGL 309 or 314	3 Social Science/Humanities Elective	3
Social Science/Humanities Elective	3 Elective	3
Elective	3	
	<b>15</b>	<b>15</b>

**Fourth Year**

Fall	Credits Spring	Credits
C R P 432	4-6 Planning Elective or Option Studio	6
C R P 331	2 Planning Elective	3
Planning Elective	3 Planning Elective	3
300-400 Elective	3 Planning Elective	3
300-400 Elective	3 300-400 Elective	3
	<b>15-17</b>	<b>18</b>

**Undergraduate Minors**

The Department of Community and Regional Planning offers 15-credit minors in Urban Studies and Geographic Information Science (GISC).

**Urban Studies**

The Urban Studies minor is earned by completing both C R P 201 (The North American Metropolis) and C R P 291 (World Cities and Globalization), plus 9 additional credit hours from the approved list of courses. At least 6 credit hours must be in courses numbered 300 or above at Iowa State. The College of Design requires students to earn a C or higher in at least 6 of the required 300-level credits. The minor must include at least nine credits that are not used to meet any other department, college or university requirement except the credit requirement for graduation. The Urban Studies minor is open to students from any college and any major.

**Introduction to Urban Studies: 6 credits**

C R P 201	The North American Metropolis	3
C R P 291	World Cities and Globalization	3

**Advanced Urban Studies: 9 credits**

ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 321	History of the American City	3
ARCH 420	Topics in American Architecture	3
ARCH 429	Topics in Italian Architecture	3
ARCH 575	Contemporary Urban Design Theory	3
C E 451	Urban Transportation Planning Models	3
CL ST 275	The Ancient City	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 293	Environmental Planning	3
C R P 301	Urban Analytical Methods	4
C R P 320	Urban Geography	3
C R P 325	Introduction to Housing	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 376	Rural, Urban and Regional Economics	3
or ECON 376	Rural, Urban and Regional Economics	

C R P 383	Theory of the Planning Process	3
C R P 417	Urban Revitalization	3
C R P 421	Financing Historic Preservation Projects	3
C R P 429	Planning in Developing Countries	3
C R P 455	Smart and Sustainable Cities	3
C R P 457	Geogames for Civic Engagement	3
C R P 460	Social Justice and Planning	3
C R P 471	Real Estate Development	3
C R P 479	Public Finance and Planning	3
C R P 484	Sustainable Communities	3
C R P 492	Planning Law, Administration and Implementation	3
C R P 573	Contemporary Issues in Global Housing	3
HIST 429	"Monstrous London": London's Histories 1500-1800	3-4
HIST 465	The American West	3
L A 274	The Social and Behavioral Landscape	3
L A 371	History of Modern Landscapes, 1750 to Present	3
L A 373	Gardens and Landscapes from Antiquity to 1750	3
POL S 271	Public Organizations and Leadership	3
POL S 310	State and Local Government	3
POL S 334	Politics and Society	3
POL S 480	Ethics and Public Policy	3
SOC 310	Community	3
SOC 331	Social Class and Inequality	3
SOC 332	The Latino/Latina Experience in U.S. Society	3
URB D 521	Foundations of Urban Design	3
URB D 522	Contemporary Urban Design Practices	3

## Geographic Information Science

The Geographic Information Science (GIS) minor is earned by taking CRP 251 and CRP 351, plus 9 additional credits from the approved list of courses. At least 6 credit hours must be in courses numbered 300 or above at Iowa State. The College of Design requires students to earn a C or higher in at least 6 of the required 300-level credits. The minor must include at least 9 credits that are not used in any other department, college or university requirement except the credit requirement for graduation. The GIS minor is open to students in any college and any major.

### Foundations of GIS: 6 credits

C R P 251:	Introduction to Geographic Information Systems	3
C R P 351:	Intermediate Geographic Information Systems	3

### GIS Tools and Techniques: 9 credits

A B E 437	Watershed Modeling and Policy	3
C R P 449	Geodesign: Planning for Sustainable Futures	3

or C R P 549	Geodesign: Planning for Sustainable Futures	
C R P 452	Geographic Data Management and Planning Analysis	3
C R P 454	Fundamentals of Remote Sensing and Spatial Analysis	3
C R P 455	Smart and Sustainable Cities	3
or C R P 555	Smart and Sustainable Cities	
C R P 456	GIS Programming and Automation	3
C R P 457	Geogames for Civic Engagement	3
or C R P 557	Geogames for Civic Engagement	
C R P 558	Web Mapping and Spatial Data Visualization	3
ENSCI 270	Geospatial Technologies	3
GEOL 452	Intro GIS for Geoscientists	3
GEOL 488	Raster GIS for Geoscientists	3
GEOL 489	Survey of Remote Sensing Technologies	3
NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	3
NREM 446	Integrating GPS and GIS for Natural Resource Management	3
URB D 532	Urban Design Media Workshop	3

## Graduate Programs

The Department of Community and Regional Planning (CRP) offers three different graduate degree options for individuals interested in engaging with communities and helping to shape their future: a Master of Community and Regional Planning (MCRP), an interdisciplinary Master of Science with an emphasis in Community Development (CDEV), and a Master of Real Estate Development (MRED).

### Master of Community and Regional Planning

The primary focus of the MCRP degree is to prepare students with the education and practical skills to be leaders in the practice of planning. The program of graduate study is accredited by the Planning Accreditation Board of the American Institute of Certified Planners. The program is STEM-designated.

Degree requirements include completion of a 2-year, 48-credit program, including a required core (24 credits), electives (18-21 credits), and a capstone component consisting of either a comprehensive exam (C R P 598X Comprehensive Exam Preparation, 3 credits) or thesis (C R P 699 Research, 6 credits). The required core consists of C R P 532, 561, 563, 564, 566, 568 and 592. Students select electives in consultation with their Program of Study Committee (POSC). Students are encouraged to complete an internship in a planning office during their course of study.

C R P 532	Community Planning Studio	6
C R P 561	Planning Theory	3



C R P 563	Planning the American Metropolis	3
C R P 564	Introduction to Analytical Methods for Planning	3
C R P 566	Policy Analysis and Planning	3
C R P 568	Planning and Development	3
C R P 592	Land Use and Development Regulation Law	3

Admission to the MCRP program is by application to the department and to the Graduate College. Students with a bachelor's degree in planning or students who have taken highly relevant coursework may be able to waive up to 9 credits of course requirements. Students must petition the department's Director of Graduate Education (DOGE) in writing prior to the first day class of the student's first semester in the program to have credits waived. No foreign language is required for the degree Master of Community and Regional Planning.

## Double Degree Programs

Double degree programs are offered with architecture (MCRP/MArch), business administration (MCRP/MBA), landscape architecture (MCRP/MLA) and sustainable agriculture (MCRP/MS). Information about our programs and how to apply can be obtained from the department's web page at: [www.design.iastate.edu/community-and-regional-planning](http://www.design.iastate.edu/community-and-regional-planning) (<http://www.design.iastate.edu/CRP/>), or send an email to [crp@iastate.edu](mailto:crp@iastate.edu).

## Master of Science in Community Development

The Master of Community Development (MCD) program is an online degree designed to educate students to become community developers and civic leaders who could bring about positive community change. Graduates of the Community Development program at Iowa State University will be skilled in understanding and articulating community problems, issues, and opportunities. Students will have the knowledge and skills to plan and facilitate community action. The MCD degree is designed for working professionals and nontraditional students through online learning. Degree requirements included completion of a 2-year, 30-credit program including a required core (15 credits) and electives (15 credits). The required core includes a capstone 3-credit practicum (COMDV 530) and COMDV 502, COMDV 503, COMDV 504, and COMDV 505.

COMDV 502	Theories and Constructs of Community Change	3
COMDV 503	Community Development Methods	3
COMDV 504	Creating Community Change	3
COMDV 505	Analysis of the Community Economy	3
COMDV 530	Community Development Practicum	3

Admission to the MCD program is through the Department of Community and Regional Planning and the Graduate College. A bachelor's degree from an accredited institution of higher education is required. Up to nine credits of course requirements may be waived with relevant coursework.

Students may petition the program's Director of Graduate Education (DOGE) in writing prior to the first day of class in the student's first semester in the program to have credits waived. Further information on the MCD program can be found on the department's web site at: <https://www.design.iastate.edu/community-and-regional-planning/degrees/master-of-community-development/>

## Master of Real Estate Development

In partnership with the Department of Finance in the College of Business, CRP offers a two-year, 33-credit Master of Real Estate Development (MRED) degree. The program is designed for working professionals, with coursework delivered in a blended online/on-campus format. During the academic year, students complete coursework remotely and come to campus for three, one-week intensive workshops throughout the two-year degree. More information on the MRED program is available on the program website: <https://www.ivybusiness.iastate.edu/masters/mred/>.

## Graduate Certificates

The Certificate in Preservation and Cultural Heritage (P+CH) is a multidisciplinary graduate program that provides the practical skills and background needed to succeed in the fields of historic preservation and cultural resource management. The certificate program is open to Iowa State University graduate students in any College of Design major as well as those majoring in history, anthropology, and related disciplines. Interested students should visit <https://www.design.iastate.edu/programs-minors/certificates/preservation-and-cultural-heritage/> or contact [historicplaces@iastate.edu](mailto:historicplaces@iastate.edu) for guidance.

The department also offers a 13-credit graduate certificate in Geographic Information Systems (GIS) in spatial analysis, GIS applications, and program management. The program is open to graduate students in all disciplines of the university. Information about the graduate certificate may be obtained from the department office and from the department's web page at: [www.design.iastate.edu/programs-minors/certificates/gis-certificate/](http://www.design.iastate.edu/programs-minors/certificates/gis-certificate/) (<https://www.design.iastate.edu/programs-minors/certificates/gis-certificate/>)

## Design Studies

### Interdepartmental Undergraduate Program

<http://www.design.iastate.edu>

The Design Studies programs bring together courses that deal with the integrated study of the conceptualization, production, visible form, uses, and history of artifacts, buildings, and environments as well as the common qualities and connections among the design, art and planning fields.

## Design Core Program

### Design Core Program: 12 cr.

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>12</b>

## Undergraduate Minors

### Minor - Critical Studies in Design

The undergraduate minor in Critical Studies in Design offers students opportunities to engage the history, theory and criticism of visual and material culture. In lectures and focused seminars, students explore historical and contemporary issues, including cultural production, the built environment, media and technology, design in everyday life, and models of professional practice. The minor is open to all undergraduates at Iowa State University.

### Minor - Design Studies

The undergraduate minor in Design Studies is constructed to facilitate design awareness among interested students and to provide a vehicle for multi-disciplinary study within the College of Design. This minor is open to all undergraduate students at Iowa State University.

### Minor - Digital Media

The undergraduate minor in Digital Media covers the knowledge and techniques for applying digital representations to generate designs and art. The body of knowledge specializes in the fields of design, art and planning. This minor is open to all undergraduate students at Iowa State University.

### Minor - Geographic Information Science (GISCI)

The undergraduate minor in Geographic Information Science (GISCI) is an interdisciplinary program that provides students with opportunities to engage the theory, processes, techniques and tools that use spatial data and computational technology to create cutting-edge analysis and mapping approaches for a wide range of fields, such as urban planning, architecture, landscape architecture, design, community development, agriculture, environmental sciences, natural resources, sociology, criminology, anthropology, political science, environmental studies and others. The minor is open to undergraduates in all university majors with a minimum overall GPA of 2.0 prior to enrolling.

### Minor - Illustration

The undergraduate minor in Illustration is ideal for students interested in illustration for books, graphic novels, magazine articles, advertising and concept art for game design and film. This minor provides the ability

to tailor a curriculum that serves these varied career interests, whether you want to work in the industry or freelance as an independent studio practitioner.

### Minor - Preservation and Cultural Heritage

The undergraduate minor in Preservation and Cultural Heritage provides students with knowledge, skills, and credentials that complement undergraduate degrees in a wide variety of majors, but especially Architecture, Interior Design, Community & Regional Planning, Landscape Architecture, and History. To these ends, the Minor has two major curricular objectives:

- Provide students with a holistic understanding of historic preservation that draws from the various departments involved, yet allows for the development of expertise within a student's specific major.
- Provide a curriculum that conforms with the National Council for Preservation Education's pedagogical guidelines and the Federal government's Professional Qualification Standards for historic preservation under 36 Code of Federal Regulations (CFR) Part 61.

The Minor requires a minimum of 15 credit hours. At least six (6) credits need to be taken at the 300 or above, and at least 9 of the 15 credits must not be used to meet any other department, college, or university requirement except the credit requirement for graduation.

### Minor - Textile Design

The undergraduate minor in Textile Design allows students to focus specifically on the design and creation of textiles — a practice with applications in the fine arts, fashion and related fields. Open to undergraduates at the sophomore level and above enrolled in any College of Design major or in the Apparel, Merchandising and Design major in the College of Human Sciences.

### Minor - Urban Studies

The undergraduate minor in Urban Studies is an interdisciplinary program that emphasizes urban life in a variety of settings and from different disciplinary and methodological approaches. The Urban Studies minor will allow students to explore varied and multiple dimensions of urban and community life through differing conceptual and analytical frameworks. The minor is open to undergraduates in all university majors except Community & Regional Planning.

Additional information about minors is available in the Student Programs and Services Office, 297 College of Design.

# Graphic Design

## Overview

<http://www.design.iastate.edu/graphicdesign/index.php> (<http://www.design.iastate.edu/graphicdesign/>)

The Curriculum in Graphic Design leads to a 124-credit undergraduate Bachelor of Fine Arts in Graphic Design including the 31-credit Core Design Program.

Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the Core Design Program. Information on admission criteria is posted each year on the College of Design website.

Transfer students with studio credits from other programs, colleges, and universities must present for departmental review a portfolio of work done in those courses in order to have the credits apply toward studio requirements. Students are required to present this portfolio upon admission and prior to registration for classes. Arrangements for this process must be made with department advisors.

A 30-graduate-credit program is offered leading to the Master of Arts with a specialization in Graphic Design for students planning to undertake a professional degree. (NOTE: Applicants without a degree background in graphic design may be required to complete up to 18 additional credits of coursework).

A 60-graduate-credit post-professional graduate program is also offered leading to the degree Master of Fine Arts.

## Student Learning Outcomes

Students in this program will be able to:

- Use creative problem solving and design processes when faced with graphic design challenges;
- Employ visual organization skills in a variety of communication media;
- Understand applications of visual communication including animation, branding, image creation, information design, interaction design, symbology, typography, video, through contemporary and emerging technologies; and
- Integrate cultural, ethical, and historical considerations in preparation for professional practice.

## Degree Requirements

### Total Degree Requirement: 124 credits

Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

### International Perspective: 3 credits

### U.S. Diversity: 3 credits

### Communications: 10 credits

ENGL 150	Critical Thinking and Communication *	3
ENGL 250	Written, Oral, Visual, and Electronic Composition *	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 110	Listening	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>10</b>

\* with a C or better

### Humanities: 6 credits

6 credits from program curriculum sheet.

### Social Sciences: 6 credits

6 credits from program curriculum sheet.

### Math/Physics/Biol. Sciences: 6 credits

COM S 106	Introduction to Web Programming	3
3 credits from program curriculum sheet		3
<b>Total Credits</b>		<b>6</b>

### General Education Courses: 12 credits

6 credits of course level 300-400 from program curriculum sheet;  
Complete 6 credits from department curriculum sheet.

### College of Design Core: 13 credits

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>13</b>

### Art and Design History: 12 credits

ART H 280	History of Art I	3
ART H 281	History of Art II	3
Six credits from program curriculum sheet		6
<b>Total Credits</b>		<b>12</b>

### Studio Options: 6 credits

6 credits from ARTIS, ARTID, LA, ARCH, or other approved studio course.

### Graphic Design: 52 credits

ARTGR 270	Graphic Design Studio I	3
ARTGR 271	Graphic Design Studio II	3
ARTGR 272	Digital Photography for Graphic Design	3
ARTGR 273	Typography I	3
ARTGR 274	Typography II	3
ARTGR 377	Graphic Design Internship Seminar	1
ARTGR 370	Graphic Design Studio III	3
ARTGR 371	Graphic Design Studio IV	3
ARTGR 387	Graphic Design History/Theory/ Criticism I	3
ARTGR 372	Graphic Materials and Processes	3
ARTGR 470	Graphic Design Studio V	3
ARTGR 471	Graphic Design Capstone	3
ARTGR 480	Graphic Design Internship	3
ARTGR 489	Design Ethics.	3
Twelve credit options from program curriculum sheet		12
<b>Total Credits</b>		<b>52</b>

### Electives: 1 credits

Remaining electives sufficient to complete graduation requirements.

Graphic Design, B.F.A.

#### First Year

Fall	Credits	Spring	Credits
DSN S 102 or 131	4	DSN S 102 or 131	4
DSN S 132	1	DSN S 183 (or General Education)	3
DSN S 183 (or General Education)	3	ENGL 150 (or General Education)	3
DSN S 110 or 115	1	General Education	3
ENGL 150 (or General Education)	3	General Education	3
General Education	3	LIB 160	1
General Education	3		
<b>18</b>		<b>17</b>	

#### Second Year

Fall	Credits	Spring	Credits
ARTGR 270	3	ARTGR 271	3

ARTGR 273	3	ARTGR 274	3
ART H 280	3	ART H 281	3
ARTIS, ARTID, LA, or ARCH Studio or ARTGR 272	3	ARTIS, ARTID, LA or ARCH studio or ARTGR 272	3
ENGL 250 (or Communication Study)	3	ENGL 250 (or Communication Study)	3
<b>15</b>		<b>15</b>	

#### Third Year

Fall	Credits	Spring	Credits	Summer	Credits
ARTGR 370	3	ARTGR 371	3	ARTGR 480 (or)	
ARTGR 372	3	ARTGR Option	3	ARTGR 495	3
ARTGR 387	3	ART or DSN History, General Education, or Rome Prep	3	Students who elect to participate in the Rome Program need to take additional 3 elective credits to reach the 123.5 needed to graduate.	
ARTGR Option	3	DSN S 301	1		
ARTIS, ARTID, LA, or ARCH Studio	3	Elective: ROME, Italian	1		
ARTGR 377	1	General Education	3		
<b>16</b>		<b>14</b>		<b>3</b>	

#### Fourth Year

Fall	Credits	Spring	Credits
ARTGR 470	3	ARTGR 471	3

ARTGR Option	3 Elective	2-3
ART & DESIGN History or General Education	3 General Education	3
ARTIS, ARTID, LA or ARCH Studio or General Ed	3 General Education	3
ARTGR 489	3 ARTGR Option	3
<b>15</b>		<b>14-15</b>

Admission into the BFA in Graphic Design Program depends upon available resources and is subject to the approval of a faculty committee at the completion of the Core Design Program. Information on the admission criteria is posted each year on the College of Design website.

## Graduate Programs

The department offers the degrees of Master of Fine Arts (M.F.A.) in Graphic Design and Master of Arts (M.A.) in Experiential Graphic Design.

Credit earned at Iowa State University or other institution for the Master of Arts degree may be applied toward the Master of Fine Arts degree at the discretion of the program of study committee.

Applicants to the graduate program should have an undergraduate major in an art or design area and demonstrate the ability to do technically competent and original work through the presentation of a digital portfolio for faculty review. Past academic performance and the quality of studio work are critical in the admission process. A minimum 3.0 GPA in the student's undergraduate major is the standard for full admission to the graduate program. Admission is also determined by studio space available within the program area, which changes yearly due to graduate students' progress in their programs of study.

Graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduates in the department can expect that additional supporting coursework, determined by the graduate faculty, may be required.

Prospective students are advised to contact the graduate coordinator with specific questions about admission procedures and portfolio review. Application and additional program information may be obtained from the

Department of Graphic Design, College of Design, Iowa State University, Ames, IA 50011-3092.

### Master of Fine Arts in Graphic Design (M.F.A.)

The Master of Fine Arts in Graphic Design is recognized as the terminal degree in the field and requires a minimum of 60 credits. M.F.A. graduates in Graphic Design are skilled in communication design, problem solving, and are adept in the use of visual language, symbology, and interaction. Graduates are proficient in the design of communications and the use of technologies that incorporate human interaction with environments, objects, and electronic and traditional publications. Students and faculty work collaboratively on a required thesis; integrating theory, creation, research, and design problem solving.

### Master of Arts in Experiential Graphic Design (M.A.)

This 30-credit degree focuses on preparing students for visual communication. This degree provides a comprehensive exposure to all aspects of user experience, including but not exclusive to wayfinding, exhibition design, interaction, information design, and placemaking.

The MAXGD is for those seeking a graphic design specialization with little to no previous experience in the area. Students may use the degree as a complement to a bachelor's degree in graphic design or another design field to enhance their skills and qualifications for employment. It can also be used to complement those students with an undergraduate degree in a graphic design area that would like to add an additional graduate level study to their coursework prior to enter the field.

### MFA in Graphic Design Degree Requirements Graphic Design Requirements, 27 cr.

ARTGR 511	Graphic Design Graduate Studio I	3
ARTGR 512	Audience and Perception	3
ARTGR 521	Graphic Design Graduate Studio II	3
ARTGR 522	Critical Media	3
ARTGR 530	User Engagement	3
ARTGR 540	Design for Behavioral Change.	3
ARTGR 610	Thesis Preparation Studio	3
ARTGR 620	Graduate Thesis Studio I	3
ARTGR 630	Graduate Thesis Studio II	3
<b>Total Credits</b>		<b>27</b>

### Graphic Design Seminar Requirements, 10 cr.

ARTGR 510	Graphic Design Theory	3
ARTGR 520	Design & Cultural Semiotics	3
ARTGR 531	Graphic Design Graduate Project Preparation	1
DSN S 501	Introduction to Research Design	3
<b>Total Credits</b>		<b>10</b>

**Elective Focus Area, 9 cr.**

Outside of graphic design but supports area of research, may be studio (ex. DSN S 546) or other class outside the College of Design: See Graphic Design MFA Suggested Minor Course List

May also include ISU Preparing Future Faculty (PFF): 3-11 cr.

**Art History, Theory, Criticism, 12 cr.**

Grad-level art/design history, theory, criticism courses in the College of Design 12

**Total Credits** 12

**Thesis, 3-6 cr.**

ARTGR 699 Research-Thesis 3-6

**Total 60 cr. minimum (not including any potential prerequisites)**

# Industrial Design

## Overview

<http://www.design.iastate.edu/industrialdesign/index.php> (<http://www.design.iastate.edu/industrialdesign/>)

The vision of the Department of Industrial Design is to empower the next generation of designers to identify and solve small to large scale problems in order to devise systemic, forward-thinking solutions, mindful of societal needs and ecological repercussions, fostering health and well-being for people and the environment.

We do this by providing students with the necessary tools and experiences, spanning across the product development timeline from the front-end of problem finding through design research and synthesis, to discovery of meaningful design solutions that can range from products to services and systems. The industrial design program offers opportunities to collaborate with diverse disciplines on campus and beyond to tackle a wide variety of local and global design challenges.

Degree offerings include the Bachelor of Industrial Design (B.I.D.) and the Master of Industrial Design (M.I.D.).

## Undergraduate Program Structure

Students in this program take a carefully defined sequence of courses developed to give them exposure and practice in the areas of theory and skill required by industrial design. These include design sketching and visualization, form development, history, creative thinking, engineering principles, research, design methodology, human factors, computer-aided design, manufacturing techniques, commercial factors, management, strategic design development, service design, and user experience design. In their third year, students select electives within and outside of the department, defining current issues in the profession. The upper-level studio classes are reserved for study abroad programs connecting students to the global design community, internships, and industry-sponsored projects with students from other departments and colleges.

The curriculum aims to develop the ability to cope with diverse problem areas in industrial design, without restricting them to specific fields in design.

An industrial design degree from Iowa State prepares students for creative careers in private and corporate practice, with design consulting companies, in-house design departments, and product manufacturers.

Career choices with an industrial design degree include (but are not limited to):

Product designer, design researcher, automotive designer, footwear & accessory designer, construction & agricultural equipment designer, furniture & lighting designer, interaction designer, service designer, exhibit designer, packaging designer, advertising & experience designer, UX designer and researcher.

## Student Learning Outcomes

Upon completion of the industrial design program students will be able to:

1. Analyze and address critically the needs of ALL stakeholders involved in the design process and avoid biases, through emphasizing critical thinking, empathy, compassion, and reflective practices. (*DIVERSITY, EQUITY & INCLUSION*)
2. Navigate and apply varying design methods and techniques commonly used to identify and solve small to large scale problems creatively and methodically. (*CREATIVE DESIGN PROCESS*)
3. Develop comprehensive products, services and systems solutions through situation and circumstance appropriate touchpoints and platforms. (*PRODUCTS, SERVICES & SYSTEMS*)
4. Understand and evaluate ethical, societal, environmental, and cultural short and long-term consequences of design solutions for all people and the planet. (*SUSTAINABILITY & ETHICAL DESIGN - aka the designers' dilemma of unintended consequences*)
5. Communicate professionally and effectively with all stakeholders of the design process from peers and co-workers to clients and end users in both forms verbally and visually. (*COLLABORATION, COMMUNICATION & PROFESSIONALISM*)

## Degree Requirements

The curriculum in Industrial Design leads to a 133-credit undergraduate Bachelor of Industrial Design including the first year Core Design Program.

Admission into the professional program depends upon available departmental resources. Updated information on admission criteria is announced yearly on the College of Design website.

Transfer students with studio credits from other programs, colleges, and universities must present a portfolio of work done in those courses, for



departmental review, in order to have the credits apply toward studio. Students are required to present this portfolio upon admission and prior to registration for classes. Arrangements for this process must be made with department advisors.

A 60-credit post-professional graduate program is also offered leading to the terminal degree Master of Industrial Design.

### Total Degree Requirements: 133 credits

Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

#### International Perspective: 3 credits

#### U.S. Diversity: 3 credits

#### Communications: 10 credits

ENGL 150	Critical Thinking and Communication (*)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (*)	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 110	Listening	
SP CM 212	Fundamentals of Public Speaking	
THRE 251	Acting Foundations	
<b>Total Credits</b>		<b>10</b>

\* with a C or better

#### Humanities: 6 credits

6 credits from program curriculum sheet

#### Social Sciences: 6 credits

6 credits from program curriculum sheet

#### Math/Physics/Biol.Sciences: 6 credits

6 credits from program curriculum sheet

#### General Education Courses: 9 credits

6 credits of course level 300-400 from program curriculum sheet:  
complete 3 credits from department curriculum sheet.

#### College of Design Core: 13 credits

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>13</b>

### History, Theory and Criticism: 15 credits

IND D 210	Fundamentals of Industrial Design	3
IND D 280	History of Industrial Design	3
IND D 380	History and Culture of Objects	3
Two courses from the approved course list; must include one 300 level or higher.		6
<b>Total Credits</b>		<b>15</b>

### Industrial Design: 60 credits

IND D 201	Industrial Design Studio I	6
IND D 202	Industrial Design Studio II	6
IND D 220	Concepts of Sketching and Making I	3
IND D 250	Activity-Centered Industrial Design	3
IND D 260	Design engineering: From Thought to Thing	3
IND D 301	Industrial Design Studio III	6
IND D 320	Design Research Methods	3
IND D 330	Creative Thinking in Design	3
IND D 340	Digital Design Technologies	3
IND D 360	Materials and Processes for Industrial Design	3
IND D 370	STEM literacy: How Things Work	3
IND D 440	Portfolio and Professional Practice	3
IND D 499	Senior Project	6
<b>Total Credits</b>		<b>51</b>
Experiential Learning: 6 credits		6
IND D 302	Industrial Design Studio IV	
IND D 397	Industrial Design Internship	
IND D 401	Industrial Design Studio V: Commercial Practices	
IND D 402	Industrial Design Studio: Design for Social Impact	
IND D 495	Study Abroad Option	
IND D 507	Industrial Design Practicum	
IND D 590	Special Topics	
IND D 592	Special Projects	
IND D 593	Experiential Learning Special Projects	
IND D 595	Study Abroad Option	
IND D 597	Internship	
<b>Total Credits</b>		<b>60</b>

### Electives: 12 credits

Electives should be assembled to support a focused area of study.

Suggested Departmental Electives:

IND D 240	Digital Tools For Industrial Design	3
IND D 350	Applied Human Factors Lab	1
IND D 435	Strategic Design: Project Management	3

IND D 460	Product Realization	3
IND D 520	Design Theory Methodology	3
IND D 530	Design Thinking	3
IND D 540	Design Communication	3
IND D 550	Human Factors: User Experience Design	3
IND D 560	Change by Design: Disruptive Innovation	3
IND D 570	Systems Thinking in Design	3
IND D 580	Material Culture and Values	3

Industrial Design, B.I.D.

#### First Year

Fall	Credits	Spring	Credits
DSN S 102 or 131	4	DSN S 102 or 131	4
DSN S 183 (or General Education)	3	DSN S 183 (or General Education)	3
ENGL 150 (or General Education)	3	DSN S 132	1
DSN S 110 or 115	1	ENGL 150 (or General Education)	3
General Education	3	General Education	3
General Education	3	General Education	3
		LIB 160	1
17		18	

#### Second Year

Fall	Credits	Spring	Credits
IND D 201	6	IND D 202	6
IND D 210	3	IND D 250	3
IND D 220	3	IND D 260	3
IND D 280	3	Departmental elective	3
15		15	

#### Third Year

Fall	Credits	Spring	Credits	Summer	Credits
IND D 301	6	Experiential Learning	6	Study Abroad	6
IND D 320	3	IND D 330	3	Elective	3
IND D 340	3	IND D 370	3		

IND D 360	3	IND D 380	3
15		15	
		9	

#### Fourth Year

Fall	Credits	Spring	Credits
Experiential Learning	3-6	IND D 499	6
IND D 440	3	Departmental Elective	3
Departmental elective	3	Departmental Elective	2-3
Gen Ed or Elective	3	Gen Ed or Elective	3
12-15		14-15	

## Graduate Program

### Master of Industrial Design | MID

#### 60 credit study | distributed across two consecutive years

What will (Industrial) Design look like in the future? Where is the field going? What new methods and methodologies will be needed to tackle current and emergent global issues? What will it mean to be human in the age of Artificial Intelligence? How will design disciplines answer to these new futures, new typologies of users, and constantly evolving technologies, and increasing environmental challenges?

These are just some of the questions we are concerned with in the MID program. Designing successfully during these times of uncertainty will require open minded designers, who, as connectors, are flexible, critical, empathetic and creative risk takers. Designers who are capable of working and collaborating in different contexts, under ever changing circumstances, across domains and most importantly in different roles.

### Description of the degree

The Master of Industrial Design (MID) program at the College of Design, Iowa State University, emphasizes a creative problem-solving based curriculum rooted in design thinking methodologies, that allows students to explore their interests in the broad and expanding field.

Industrial Design is a human-centered discipline that questions existing boundaries and makes connections among diverse domains. Therefore, the program challenges students to develop the ability to recognize and define problems in new ways, and then find opportunities others might have missed or undervalued. Through a strategic and creative problem-solving process, Industrial Design tries to reimagine how we should go about developing innovative, sustainable and durable solutions for people and society at large that genuinely lead to better quality of life and better futures. The MID program actively connects with other knowledge domains and disciplines, to research how things are with

the drive to propose how they ought to be. This is achieved through the challenging balance between critical and creative ways of thinking [and working] when devising novel, useful and meaningful artifacts, services, experiences, and environments. Ultimately, the program integrates the design triad of people, business, and technology, in innovative ways, and is based on insightful research to create new value and competitive advantage in a variety of societal, economic, and environmental contexts.

## Details about the degree

The MID program is centralized on the creation and application of new knowledge through in-depth investigations of existing 'gaps' culminating in a graduation project, which includes a creative component (project based) or a written thesis (research focused). At the same time, students expand their design practice skills using different methodologies, collaboratively, throughout the entire design process. They explore, generate, transfer, and implement interdisciplinary insights into foundational knowledge for the discipline of Industrial Design.

The MID is accredited and recognized as a terminal degree in Industrial Design. This graduate program is designed to offer significant mix of skills and experiences, including students from different disciplinary backgrounds, faculty-directed research programs, internships, international study abroad, industry-sponsored coursework, and also teaching experience.

The MID program is positioned in one of the most comprehensive design colleges in the country, facilitating the integration of methodologies and skill sets from multiple disciplines. Additionally, the program has established curricular connections to the nationally ranked College of Engineering and its Human Computer Interaction Graduate Program, the Ivy College of Business, as well as to numerous industry collaborators and practitioners.

Degree requirements includes a completion of a 2-year, 60-credit program, including a required core (45 credits), focused electives (9-12 credits) and experiential learning credits (3-6 electives). The final MID Graduate Project includes one of the following: a) creative component with a design process report (6 credits) or b) research-focused written thesis (6 credits). Students and their supervisory team work collaboratively on the in-depth graduate project, adding to the body of knowledge of [industrial] design through investigating, exploring and solution finding of a complex [industrial] design problem.

## Curriculum Outline

Required Core Courses: 45 cr.

IND D 501	Industrial Design Graduate Studio I	6
IND D 502	Industrial Design Graduate Studio II	6
IND D 520	Design Theory Methodology	3
IND D 530	Design Thinking	3
IND D 540	Design Communication	3

IND D 550	Human Factors: User Experience Design	3
IND D 570	Systems Thinking in Design	3
IND D 580	Material Culture and Values	3
IND D 599X	Creative Component	6
IND D 601	Industrial Design Graduate Studio III	6
IND D 699	MInD Graduate Thesis	6
IND D 640	Advanced Digital Technologies	3

### Suggested Focused Electives 9-12 cr.

IND D 435	Strategic Design: Project Management	3
IND D 440	Portfolio and Professional Practice	3
IND D 460	Product Realization	3
IND D 505	MInD Lab I	3
IND D 510	MInD Lab II	3
IND D 515	Graduate Colloquium	1
IND D 560	Change by Design: Disruptive Innovation	3
IND D 630	Critical Reflections for Thesis Preparation	3

### Or Experiential Learning:

IND D 592	Special Projects (3-6 credits)	arr †
IND D 593	Experiential Learning Special Projects (3-6 credits)	arr †
IND D 595	Study Abroad Option	6
IND D 597	Internship	6

### † Arranged with instructor.

#### First Year

Fall	Credits Spring	Credits
IND D 501	6 IND D 502 or DSN S 546	6
IND D 520	3 IND D 540	3
IND D 530	3 IND D 550	3
IND D 570	3 IND D 580	3
Departmental Elective	3 Departmental Elective	3
	<b>18</b>	<b>18</b>

#### Second Year

Fall	Credits Spring	Credits
IND D 601	6 IND D 640	3
Focused Elective	3 IND D 599X or IND D 699	6
ISU or College Elective	3 ISU or College elective	3
ISU or College Elective	3 ISU or College Elective	3
	<b>15</b>	<b>15</b>

Admission to the MID program is by application to the department and to the Graduate College. Information about our programs and how to apply can be obtained from the department's web page at: <https://>

[www.design.iastate.edu/industrial-design/degrees/master-of-industrial-design/](http://www.design.iastate.edu/industrial-design/degrees/master-of-industrial-design/), or send an email directly to the Director of Graduate Studies.

## Integrated Studio Arts

### Overview

<http://www.design.iastate.edu/artvisualculture/index.php> (<http://www.design.iastate.edu/artvisualculture/>)

The Department of Art and Visual Culture offers degree programs focused on fine arts and visual culture, offering courses in studio arts, art history, art education, and scientific illustration. Degree offerings include the Bachelor of Arts (BA) in Art and Design, Bachelor of Fine Arts (BFA) in Integrated Studio Arts, and Master of Fine Arts (MFA) in Integrated Visual Arts.

### BFA Integrated Studio Arts (ISA) (Fine/Studio Arts)

Students will select from ISA's studio options including ceramics, digital media, drawing, furniture/wood design, illustration, jewelry and metalsmithing, scientific illustration, mixed media, new genres, painting, photography, printmaking, and textiles.

Over the four-year course of study students will develop a portfolio and prepare for a professional practice in the visual arts. This concentration engages aesthetics, visual problem-solving, critical thinking, and skill development, drawing on historical and cultural theory, contemporary trends, and studio practice.

Transfer students with studio credits from other colleges and universities may present a portfolio of work created in those courses to determine if these credits can be applied toward specific studio requirements.

Students will present this portfolio upon admission and prior to registration for classes. Arrangements for this process should be made with the department's academic advisors.

The department offers an undergraduate minor in Illustration and participates in the undergraduate minors in Classical Studies, Critical Studies in Design, Design Studies, Digital Media, and Textile Design.

### Student Learning Outcomes

Students will learn to:

- develop creative problem-solving abilities and traditional and innovative technical skills through the design, research, and creative processes;
- understand and express in multiple media the relationship between objects, aesthetics, and meaning;
- exhibit an awareness of their roles as artists and thinkers regarding the ethical, cultural, and ecological impacts of what they do;

- express through visual, verbal, and written means an awareness of global art movements and a meaningful understanding of historic and contemporary art; and
- use their understanding and practice of art to engage with local, national, and global communities where they can participate in broad exchange of ideas.

## Degree Requirements

The curriculum in leads to a 128-129 credit undergraduate Bachelor of Fine Arts in Integrated Studio Arts. Admission into the program requires the completion of at least 31.0 credits, including the following courses: DSN S 102, DSN S 110 or 115, DSN S 131, DSN S 132, and DSN S 183; 6 credits of Social Sciences/Humanities; 6 credits of Math/Science; ENGL 150 (or test-out credit); LIB 160. Information on admission criteria is posted each year on the College of Design website.

### Total Degree Requirement: 128-129 cr.

Only 65 credits from a two-year institution can apply, and may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

### International Perspective: 3 credits

### U.S. Diversity: 3 credits

### Communication: 10 credits

(C or better grade ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One course from the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 212	Fundamentals of Public Speaking	

**Total Credits** 10

### Humanities: 6 credits

6 credits from College of Design General Education Approved Course list

### Social Sciences: 6 credits

6 credits from College of Design General Education Approved Course list

### Math/Physics/Biol. Sciences: 6 credits

6 credits from College of Design General Education Approved Course list

### General Education Courses: 9 credits

6 credits at level 300-400 from College of Design General Education Approved Course List

3 credits from College of Design General Education Approved Course list

**Total Credits** 9

**College of Design Core: 13 credits**

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>13</b>

**Integrated Studio Arts Core: 31 credits**

ARTIS 202	Studio Fundamentals: Wood	2
ARTIS 203	Studio Fundamentals: Jewelry/Metalsmithing	2
ARTIS 204	Studio Fundamentals: Ceramics	2
ARTIS 206	Studio Fundamentals: Printmaking	2
ARTIS 208	Color	2
ARTIS 210	Studio Fundamentals: Photo	2
ARTIS 212	Studio Fundamentals: Digital Media	3
ARTIS 213	Studio Fundamentals: Painting	2
ARTIS 214	Studio Fundamentals: Textiles	2
ARTIS 230	Drawing II	3
ARTIS 310	Sources and Methods of Visual Art	3
ART H 280	History of Art I	3
ART H 281	History of Art II	3
<b>Total Credits</b>		<b>31</b>

**ISA Concentration: 24 credits**

Eight courses from ARTIS studio offerings. Faculty advisors will assist students in developing their studio concentration plan.

**Art History: 9 credits**

At least 6 credits from ART H 300+ course level.

**Professional Practice: 3 credits**

ARTIS 399	BFA Professional Practice	2
ARTIS 499	BFA Exhibition	1
<b>Total Credits</b>		<b>3</b>

**Electives: 11 credits**

Integrated Studio Arts. BFA

**First Year**

Fall	Credits	Spring	Credits
DSN S 102 or 131	4	DSN S 102 or 131	4
DSN S 110 or 115	1	DSN S 183 (or General Education)	3
DSN S 132	1	ENGL 150 (or General Education)	3

DSN S 183 (or General Education)	3	General Education	3
ENGL 150 (or General Education)	3	General Education	3
General Education	3	LIB 160	1
General Education	3		
<b>18</b>		<b>17</b>	

**Second Year**

Fall	Credits	Spring	Credits
ART H 280 (fall only)	3	ART H 281 (spring only)	3
ARTIS 212 or 230	3	ARTIS 230 or 212	3
ARTIS Studio Fundamentals	2	ARTIS Studio Fundamentals	2
ARTIS Studio Fundamentals	2	ARTIS Studio Fundamentals	2
ARTIS Studio Fundamentals	2	ARTIS Studio Fundamentals	2
ARTIS Studio Fundamentals	2	ARTIS Studio Fundamentals	2
ENGL 250 (or General Education)	3	ENGL 250 (or General Education)	3
<b>17</b>		<b>17</b>	

**Third Year**

Fall	Credits	Spring	Credits
ARTIS 310	3	ARTIS Studio Option	3
ARTIS Studio Option	3	ARTIS Studio Option	3
ARTIS Studio Option	3	ARTIS Studio Option	3
ART H 300 level or above	3	ART H 300 level or above	3
General Education	3	ARTIS 399	2
		DSN S 301 (Rome option only)	1
<b>15</b>		<b>15</b>	

**Fourth Year**

Fall	Credits	Spring	Credits
ARTIS Studio Option	3	ARTIS Studio Option	3
ARTIS Studio Option	3	ARTIS Studio Option	3
ART H 300 level or above	3	ARTIS 499	1
General Education or Elective	3	General Education	3
Elective	3	Elective	5
<b>15</b>		<b>15</b>	

**Post-Baccalaureate Undergraduate Certificate**

Iowa State's Post-Baccalaureate Undergraduate Certificate program in Integrated Studio Arts (ISA) prepares students for either graduate study or career advancements by providing a focused environment

for advancing aesthetic, technical, creative, and conceptual skills. While a bachelor's degree in visual or fine arts is not necessary, a strong portfolio of creative work and a written statement of purpose are required for admission. Download application requirements ([https://www.design.iastate.edu/wp-content/uploads/2021/03/Postbaccalaureate\\_ISA.pdf](https://www.design.iastate.edu/wp-content/uploads/2021/03/Postbaccalaureate_ISA.pdf)) (PDF) or view online. (<https://www.design.iastate.edu/art-and-visual-culture/degrees/post-baccalaureate-undergraduate-certificate/>)

## Curriculum

Post-baccalaureate students will work with a faculty advisor to create a tailored 25-credit program of study including:

- 15 credits of 300/400-level Integrated Studio courses
- Six (6) credits of 300/400-level art history courses
- Three-credit elective selected from a list of options
- ARTIS 491: One-credit capstone exhibition course

For the capstone experience, you will be expected to produce an artist's statement and a written assessment of your learning that will be reviewed, along with your art, by the arts faculty.

This certificate program must be completed within two years. Students interested in developing a body of work for admission to graduate school or to focus on further skill development prior to moving into professional practice will be ideal candidates.

## Application Requirements

To apply for this program, please submit the following materials.

1. Digital portfolio:
  - Twenty (20) images of recent work with no more than four (4) of the images being details
  - Descriptions on each image need to include title, date, size and medium
2. One-page statement of intent
3. Current resume
4. Name and contact information of three (3) references

## Graduate Program

The department offers the Master of Fine Arts (MFA) in Integrated Visual Arts (IVA). The MFA curriculum in IVA requires a minimum of 60 credits. This MFA is a unique interdisciplinary program offering integrative study among a combination of media areas including ceramics, computer applications, drawing, textiles, illustration, jewelry/metalsmithing, painting, printmaking, photography, furniture/wood design and areas outside of AVC. The IVA program offers an innovative curriculum aligned with emerging art and design markets.

IVA graduates link traditional studio disciplines with interdisciplinary studies. Graduates are prepared as visual artists to enter studio practice, business, higher education, or new interdisciplinary fields. The MFA is recognized as the terminal degree. A required thesis exhibition is composed of two parts: a substantial solo exhibition; and a written thesis statement that describes the development of the work in the exhibition, its objectives, and its historical and cultural points of reference. A written thesis with no exhibition component may be an appropriate alternative, but some portion of the work should entail an element of creative problem-solving in the form of a visual product.

Upon completion of the graduate program IVA graduates are expected to:

- Have developed a fully realized creative direction which provides a platform for continued professional research and growth, and visual expression;
- Have produced a body of work which demonstrates a high level of creative investigation and accomplishment;
- Have acquired a professional level of technical proficiency in one or more media areas;
- Effectively communicate their ideas verbally and in writing;
- Understand the context, both historical and current, within which their creative pursuits exist;
- Have developed a well-formed and informed personal creative philosophy and a strong studio skill set;
- Understand current and relevant ethical, ecological, and social issues; and
- Use relevant theory in pursuing creative university-level scholarship.

## Studio Courses: 39 credits

Courses numbered ARTIS	27
Studio Courses outside of ISA	6
ARTIS 699A and ARTIS 699B	6

## Seminar Courses: 6 credits

(Students take 2 sections of ARTIS 571, or 1 section of ARTIS 571 and ARTIS 511)

Graduate Seminar ARTIS 571	3
	credits
	each
	section
ARTIS 571A	Graduate Seminar: Grants, Residencies, Exhibitions, Entrepreneurialism
ARTIS 571B	Graduate Seminar: Critique and Creative Process
ARTIS 511	Seminar in Teaching



Art History/Theory/Criticism: 12 credits

ART H 501 required	3
Art History courses	9

Related Courses (outside of IVA program): 3 credits  
Total: 60 Credits

Interdisciplinary Design

OVERVIEW

Design plays a crucial role in innovation, imagination and human creativity. The secondary major in Interdisciplinary Design is an asset on any resume. It offers courses for students interested in pursuing careers and futures related to creative leadership, design for social change, disruptive innovation and user experience (UX), and provides the knowledge and skill sets necessary to address complex challenges and contemporary societal problems using key innovation and entrepreneurial concepts.

Interdisciplinary Design explores the central principle of human-centered experiences, and how people — users, customers, markets, audiences — are at the core of all creative activities and endeavors. Interdisciplinary Design dives deeply into the fundamental concepts that explain creative processes, from collaboration to iteration to implementation.

This program provides a strong foundation in creative problem solving, design thinking, strategic design, leadership and project management and new product development. Interdisciplinary Design builds an understanding of the innovation journey through design tools and techniques for ideation, insights forecasting and prototyping with users. This is the place to initiate a project, explore how to take an idea to execution and discover how to turn an insight into a reality.

The Interdisciplinary Design curriculum is built around a set of required innovation and design entrepreneurship-focused interdisciplinary studios and other required and elective courses, with many options for students across all university majors.

Student Learning Outcomes

Upon completion of the Interdisciplinary Design degree program, students will be able to:

- generate ideas and be creative and innovative makers who use design methods, theory, and applications from multiple disciplines;
- think strategically and creatively about society's increasing economic, social, and environmental challenges across scales and levels of complexity;
- integrate and apply principles, values, and mindsets of innovation and entrepreneurship;
- synthesize knowledge from many sources and work collaboratively within interdisciplinary teams; and

- work with confidence in contexts where design thinking, skills in making, and critical analysis are valued.

Secondary Major

The secondary major in Interdisciplinary Design requires a minimum of 30 semester credits. Students seeking a secondary major in Interdisciplinary Design must complete:

Anchor Courses: 18 cr.

DES 150	Introduction to Innovation and Design	3
DES 230	Design Thinking	3
DES 240	Design Innovation Studio	3
DES 340	Design Entrepreneurship Studio	3
DES 495	Design Innovation Launchpad	6
Total Credits		18

Other Required Courses: 9-10 cr.

For majors outside the College of Design

3 credits in a design history course
3 credits in Communications; choose from SP CM 212, ENGL 302, ENGL 314

For College of Design majors

DSN S 102	Design Studio I
DSN S 183	Design in Context
3 credits in Communications; choose from SP CM 212, ENGL 302, ENGL 314	

Electives: 3 cr.

DES 250	Design Intersections	3
Or approved elective(s) from a College of Design department (please consult with academic advisor to choose an approved elective that enhances depth of knowledge in first major)		

Interior Design  
Overview

<http://www.design.iastate.edu/interiordesign/index.php> (<http://www.design.iastate.edu/interiordesign/>)

The department offers the degrees Bachelor of Fine Arts (BFA) in Interior Design, Master of Arts (MA) in Interior Design, and Master of Fine Arts (MFA) in Interior Design.

BFA Interior Design

Emphasis is on the student's application of design processes to creatively solve problems of the interior environment based on knowledge of human safety, functional utility, and physical, psychological, and contextual fit. Graduates in interior design are competent in visual

communication (sketching, drafting, and computer-aided design), design problem solving, space planning, lighting and color specification for interiors, finish and furniture selection, detailing interior construction, and application of human factors. The curriculum is accredited by the Council for Interior Design Accreditation (CIDA) as providing professional-level education.

Transfer students with studio credits from other colleges and universities must present a portfolio of work done in those courses to determine if these credits can be applied toward specific studio requirements. Students are required to present their portfolio upon admission and prior to registration for classes. Arrangements for this process must be made with department advisors.

## Graduate Study

A 34-graduate-credit program is offered leading to the Master of Arts, for students planning to undertake professional or design research-oriented pursuits. (NOTE: Applicants without a previous undergraduate degree in interior design may be required to complete up to 40 additional credits of deficiency work).

A 60-graduate-credit post-professional graduate program is also offered leading to the degree Master of Fine Arts.

## Student Learning Outcomes

All graduating students with a BFA in Interior Design will:

- Develop an understanding of the design process to creatively solve a design problem and apply the design elements and principles to design solutions.
- Communicate ideas and design solutions effectively in written, oral, and visual form, including presentations of studio-based work.
- Collaborate in team-based projects with other students in interior design and work effectively in interdisciplinary teams, including an understanding of the role of interior designers in practice.
- Apply research and theories to projects, including the evidence of human-centered design in the built environment; develop an appreciation of global cultures and the history of interiors, architecture, and art.
- Demonstrate knowledge in the technical aspects of interior design, specifically in light and color, products and materials, environmental systems and human wellbeing, construction, and regulations and guidelines.

## Degree Requirements

The curriculum in Interior Design leads to a 129-credit undergraduate Bachelor of Fine Arts in Interior Design including completion of the Core Design Program.

Admission into the professional program follows completion of the Core Design Program and depends upon available resources. Information on admission criteria to each professional degree is posted each year on the College admissions website.

### Total Degree Requirement: 129 cr.

Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA; Completion of all requirements listed below.

#### International Perspective: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communication: 10 cr.

(C or better grade ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One course from the following:		3
COMST 101	Introduction to Communication Studies	
COMST 211	Interpersonal Communication	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>10</b>

#### Humanities: 6 cr.

6 credits from program curriculum sheet.

#### Social Sciences: 6 cr.

6 credits from program curriculum sheet.

#### Math/Physics/Biol. Sciences: 6 cr.

One of the following:		3
MATH 104	Introduction to Probability	
MATH 105	Introduction to Mathematical Ideas	
MATH 140	College Algebra	
	or MATH 15(Discrete Mathematics for Business and Social Sciences	
Three credit hours from program curriculum sheet.		3
<b>Total Credits</b>		<b>6</b>

#### General Education Courses: 9 cr.

9 credits from program curriculum sheet; 6 credits of course level 300-400.

#### College of Design Core: 13 cr.

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
	or DSN S 110 Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1

DSN S 183	Design in Context	3
Total Credits		13

General Design History: 6 cr.

Select 6 credits from any College of Design history courses.

Interior Design: 61-63 cr.

ARTID 250	Fundamentals of Interior Design	2
ARTID 251	Human Factors in Interior Design	3
ARTID 261	Graphic Communication for Interior Design I	3
ARTID 263	Graphic Communication for Interior Design II	3
ARTID 265	Interior Design Studio I	4
ARTID 267	Interior Design Studio II	4
ARTID 350	Interior Finish Materials	3
ARTID 351	Interior Regulations and Guidelines	3
ARTID 352	Interior Building Systems	3
ARTID 353	Interior Construction and Details	3
ARTID 355	Interior Design History/Theory/Criticism I	3
ARTID 356	Interior Design History/Theory/Criticism II	3
ARTID 360	Interior Design Internship Seminar I	1
ARTID 361	Interior Design Internship Seminar II	1
ARTID 365	Interior Design Studio III	4
ARTID 367	Interior Design Studio IV	4
ARTID 460	Interior Design Internship Documentation	1
ARTID 461	Interior Design Professional Practices	2
ARTID 465	Interior Design Studio V	4
DSN S 546	Interdisciplinary Design Studio	4-6
Select course from ARTID 569-579 Advanced Studies in Interior Design		3
Total Credits		61-63

Studio/Business Option: 6 cr.

6 credits from program curriculum sheet.

Electives: 4-6 cr.

Complete electives sufficient to complete graduation requirements.

Interior Design, B.F.A.

Four Year Plan

Freshman

Fall	Credits	Spring	Credits
DSN S 102 or 131	4	DSN S 102 or 131	4
DSN S 115	3	DSN S 183 (or Gen Edu)	3
DSN S 132	3	ENGL 250 (or Gen Edu)	3
DSN S 183 (or Gen Edu)	3	Gen Edu	3
ENGL 150	3	Gen Edu	3

ARTID 250 (or Gen Edu)	2-3 LIB 160	1
Gen Edu	3	
17-18		17

Sophomore

Fall	Credits	Spring	Credits
ARTID 250 (or Gen Edu)	2-3	ARTID 251	3
ARTID 261	3	ARTID 263	3
ARTID 265	4	ARTID 267	4
ARTID 353	3	ARTID 350	3
ARTID 355	3	ARTID 356	3
		(DSN S 301-Rome Prep)	0-1
15-16		16-17	

Junior

Fall	Credits	Spring	Credits
ARTID 360	1	ARTID 352	3
ARTID 365	4	ARTID 361	1
Studio/Bus Option	3	ARTID 367	4
Gen Design Edu or Gen Edu	3	Gen Design Edu	3
ARTID 351	3	Gen Edu	3
Gen Edu	3	Gen Edu	3
17		17	

Senior

Fall	Credits	Spring	Credits
ARTID 465 (Gen Edu )	4	ARTID 461	2
ARTID 460	1	DSN S 546	4-6
Advanced Studies in Interior Design (or Gen Edu)	3	Advanced Studies in Interior Design (or Gen Edu)	3
Studio/Bus Option	3	Gen Edu or Elective	3
Gen Edu	3		
Gen Edu or Elective	3		
17		12-14	

Students enrolled in the Bachelor of Interior Design Program at ISU may apply for concurrent undergraduate/graduate status prior to their final semester of their undergraduate program. If accepted, students will be allowed to register for six graduate credits and apply the credits to an MA degree.

Graduate Study

The Department of Interior Design offers two graduate degrees in interior design: a five-semester Master of Fine Arts (MFA) and a three-semester Master of Arts (MA), each of which requires a thesis. The degree programs encourage interdisciplinary work within the College of Design and across related fields within the university. We currently offer

double-degree programs and an interdisciplinary PhD program in Human Computer Interaction (HCI) with a home department in Interior Design. Financial support in the form of teaching and research assistantships is available on a competitive basis.

## Master of Fine Arts in Interior Design (MFA)

The MFA is a terminal degree in Interior Design with a required thesis and a creative component. It is designed for students with undergraduate degrees in Interior Design or closely related disciplines and for students from other disciplines who complete required prerequisites in the Department of Interior Design. The MFA in Interior Design Program prepares students to become professionals in practice, teaching, and research.

The MFA program encourages students to research and engage diverse contemporary issues within design specializations across the field of Interior Design. Faculty in the program provide students with opportunities to engage and address social, cultural, environmental, historical, practical, and other concerns within regional, national, and international contexts. They amalgamate traditional methods and contemporary technologies, and encourage students to develop new processes and methods as needed. Faculty members promote inclusive designs that accommodate current and future needs across diverse cultures and populations. The Interior Design Graduate Programs expect graduates to approach research and interdisciplinary coursework with dedication and commitment.

The MFA curriculum has an intensive five-semester course sequence that emphasizes foundations of interior design including methods, theory, process, the human condition, and studio. Design seminars offer training in varied interior design specializations including preservation and cultural heritage, inclusive design, lighting, color theory, research methods, and environmental design. The program offers study abroad opportunities, studios with specialized faculty, and independent study projects. Interdisciplinary option studios apply and integrate core-course content with technical proficiency in areas of preservation and cultural heritage, healthcare, design for elderly populations, and hospitality, among others. During the last two semesters students explore interior design through focused research and a written thesis. The MFA program concludes with a public defense of the thesis that includes a thesis exhibition with graphic representations of the research.

Students admitted to the program hold undergraduate degrees in a broad range of fields. A student without an undergraduate degree in interior design or interior architecture must complete the curriculum's prerequisites listed in curriculum sheets posted on the Graduate Programs in Interior Design's website (<https://www.design.iastate.edu/interior-design/graduate-degrees/graduate-program-overview/>). Students with undergraduate degrees in closely related to design fields may be eligible to waive part of the prerequisites in the program.

## Master of Fine Arts (MFA), 60 Credits

### Design Innovation and Social Entrepreneurship: Select 9 credits

ARTID 569	Advanced Studies in Interior Design: Variable Topics	3
ARTID 570X	Social Entrepreneurship in Aging	3
ARTID 571	Advanced Visualization in Interior Design	3
ARTID 572	Preservation & Cultural Heritage	3

### Equitable and Inclusive Environments: Select 9 credits

ARTID 551A	Design Humanics: Sensory Perception & Ergonomic Factors	3
ARTID 551B	Design Humanics: Environment & Behavior	3
ARTID 573	Advanced Color Theory	3
ARTID 574	Inclusive Environments	3

### Methods and Practicum: 9 credits

ARTID 552	Evidence-Based Design	3
ARTID 554	Interior Design Teaching Practicum	3
ARTID 660	Research Methods (or DSN S 501 Introduction to Research Design)	3

### Studio Courses: 20 credits

ARTID 668	Advanced Experimental Interior Design	4
ARTID 668	Advanced Experimental Interior Design	4
DSN S 546	Interdisciplinary Design Studio *	6
DSN S 546	Interdisciplinary Design Studio *	6

\* This course is offered for variable credits. Students should select a section offered for 6 credits.

## Thesis and Creative Component: 12 credits

ARTID 699A	Thesis	6
ARTID 699B	Thesis-Exhibition	6

### Electives: 8 cr.

### Total: 60 credits

## Master of Arts in Interior Design (MA)

The post-professional Master of Arts (MA) in Interior Design is a 34-credit research degree with required a graduate thesis. The MA degree is open to applicants who hold a professional degree in Interior Design or Interior Architecture from an accredited program. The MA in Interior Design degree prepares students to become competent professionals in Interior Design practice, while the written research thesis contributes to the body of knowledge in the field.

MA candidates are required to develop a thesis proposal with a statement of purpose, research questions, literature review, methods summary, and outline of proposed chapters. A first professional degree is also open for applicants with non-professional degrees in various fields with the completion of required prerequisites in the Department of Interior Design.

A first professional MA for graduates in closely related design fields may allow some prerequisite courses to be waived.

### Master of Arts in Interior Design (MA), 34 Credits

#### Design Innovation and Social Entrepreneurship: Select 6 credits

ARTID 569	Advanced Studies in Interior Design: Variable Topics	3
ARTID 570X	Social Entrepreneurship in Aging	
ARTID 571	Advanced Visualization in Interior Design	3
ARTID 572	Preservation & Cultural Heritage	3

#### Equitable and Inclusive Environments: Select 6 credits

ARTID 551A	Design Humanics: Sensory Perception & Ergonomic Factors	3
ARTID 551B	Design Humanics: Environment & Behavior	3
ARTID 573	Advanced Color Theory	3
ARTID 574	Inclusive Environments	3

#### Methods: 6 credits

ARTID 552	Evidence-Based Design	3
ARTID 660	Research Methods (or DSN S 501 Introduction to Research Design)	3

#### Studio Courses: 10 credits

DSN S 546	Interdisciplinary Design Studio	6
ARTID 668	Advanced Experimental Interior Design	4

#### Thesis: 6 credits

ARTID 699A	Thesis	6
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#### Total: 34 credits

#### Dual Degrees

Double-degree programs are offered with the Department of Architecture with a Master of Arts (MA) in Interior Design and a Master of Architecture (MArch). The graduate program also offers a PhD in Human Computer Interaction (HCI) with home department in Interior Design. Information about our programs and how to apply can be obtained from the department of Interior Design Graduate Program website and from the graduate school's departmental web page.

## Landscape Architecture

### Overview

Landscape architecture is an environmental design discipline. Landscape architects actively shape the human environment: they map, interpret, imagine, draw, build, conceptualize, synthesize, and project ideas that transform landscapes. The design process involves creative expression that derives from an understanding of the context of site (or landscape) ecosystems, cultural frameworks, functional systems, and social dynamics. Students in our program learn to change the world around them by re-imagining and re-shaping the landscape to

enhance its aesthetic and functional dimensions, ecological health, cultural significance, and social relevance. The profession addresses a broad range of landscapes in urban, suburban, rural, and wilderness settings. The scale of landscape architecture projects varies from broad, regional landscape analysis and planning to detailed, individual site-scale designs. The curriculum at Iowa State prepares students for this challenge as they develop their abilities to design and communicate ideas through a sequence of foundational courses and studios. The program seeks to produce graduates who understand the ethical, social, and environmental/ecological dimensions of issues involving changes in the landscape.

Graduates are active in a broad range of careers, such as sustainable site design, land development, park management, environmental advocacy, community planning, urban design, and others. In their professional lives, graduates apply their creative and technical skills in the planned arrangement of natural and constructed elements on the land with a concern for the stewardship and conservation of natural, constructed, and human resources. The resulting environments serve useful, aesthetic, safe, and enjoyable purposes. Graduates are able to communicate effectively with colleagues in the sciences and humanities as well as in the allied professions, and are prepared to work individually and in multidisciplinary teams to address complex problems dealing with the cultural/ecological environment.

The department offers graduate and undergraduate degree programs and cooperates in the undergraduate minors in Design Studies, Critical Studies in Design, and Digital Media.

The undergraduate curriculum includes one year of the college's Core Design Program followed by four years in the professional program. Applicants are reviewed on the basis of academic performance and a portfolio of original work; admission to the professional program is subject to the approval of a faculty committee at the completion of the Core Design Program. Information on admission criteria is posted each year on the College of Design website.

Following admission to the professional program, students embark on the traveling studio during the fall semester of their second year. This studio is a full semester's credit of integrated departmental courses and involves extensive travel within and beyond the great Midwest region of North America, to study regional natural systems and the cultural responses to those systems.

To enhance the study of landscape architecture in off-campus settings, the department requires students to choose from among the following options during the spring and summer of their fourth year: 1. a professional internship 2. the College of Design Rome Program 3. an independent study abroad experience or 4. National Student Exchange. The department assists students with placement, and additional

information is provided through the department and the College of Design's Career Services Office.

The undergraduate program consists of a five-year curriculum, requiring 150 credits, leading to the degree Bachelor of Landscape Architecture. These credits are distributed between a one-year Core Design Program of 30 credits and a four-year professional program of 120 credits.

## Student Learning Outcomes

- Understand and practice design as an iterative process
- Design landscapes as part of the built material world from concept to detail
- Select and use a wide range of manual and digital techniques to communicate ideas; utilize appropriate communication and representation techniques based on the design problem
- Present a project clearly and concisely to a client, community, or user group and produce professional communications
- Produce basic construction documents and other project documentation including plans and specifications
- Incorporate knowledge of ecology and plants into design proposals
- Understand and practice landscape architecture as a continuously changing historical and cultural activity
- Interpret how social, cultural, and political dynamics affect the use and design of public and private space
- Function effectively in collaborative and multidisciplinary settings
- Practice professional ethics, judgment, and skills and understand the professional's role as a fiduciary

## Degree Requirements

The department offers graduate and undergraduate degree programs.

The undergraduate program consists of a five-year curriculum, requiring 150 credits, leading to the degree Bachelor of Landscape Architecture. These credits are distributed between a one-year Core Design Program of 31 credits and a four-year professional program of 119 credits.

Admission into the professional program depends upon available resources and is subject to the approval of a faculty committee at the completion of the Core Design Program. Applicants are reviewed on the basis of academic performance and a portfolio of original work. Information on admission criteria is posted each year on the College of Design website.

The BLA from Iowa State University is an LAAB (Landscape Architectural Accreditation Board)-accredited professional degree program. In the United States, most state registration boards require a degree from an accredited professional degree program as a prerequisite for professional licensure. The LAAB is the sole entity recognized by the Council for

Higher Education Accreditation to accredit U.S. first-professional degree programs in landscape architecture at the bachelor's and master's levels.

## Total Degree Requirement: 150 credits

Only 65 credits from a two-year institution may apply, which may include up to 16 technical credits; 9 P-NP credits of free electives; 2.00 minimum GPA.

### International Perspective: 3 credits

### U.S. Diversity: 3 credits

### Communications: 10 credits

(C or better grade in ENGL 150 and ENGL 250)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>10</b>

### Humanities: 9 credits

9 credits from PHIL, HIST, MUSIC or other humanities course offerings.

### Social Sciences: 6 credits

6 credits from ANTHR, ECON, POL S, PSYCH, or SOC.

### Mathematics and Science: 12 credits

One of the following:		3-4
MATH 140	College Algebra	
MATH 145	Applied Trigonometry	
MATH 165	Calculus I (4 crs)	
ENV S 120	Introduction to Renewable Resources	3
Science Elective		6

### Additional General Education Course 3 credits

3 credits from 300-400-level courses

### Design Core: 13 credits

DSN S 102	Design Studio I	4
DSN S 115	Design Collaborative Seminar	1
or DSN S 110	Design Exchange Seminar I	
DSN S 131	Drawing I	4
DSN S 132	Digital Design Literacy	1
DSN S 183	Design in Context	3
<b>Total Credits</b>		<b>13</b>

### Landscape Architecture: 85 credits

L A 201	Studio: Landscape Interpretation and Representation	6
L A 202	Studio: Site Design I	6



L A 211	Digital Design Methods for Landscape Architecture	3
L A 241	Developing Identity as a Landscape Architect	1
L A 272	Landscape Studies	3
L A 274	The Social and Behavioral Landscape	3
L A 281	Investigating Landscape Form, Process, and Detail	3
L A 301	Site Design II	6
L A 302	Ecological Design	6
L A 322	Fundamentals of Planting Design	3
L A 341	Contemporary Landscape Architecture	1
L A 371	History of Modern Landscapes, 1750 to Present	3
L A 373	Gardens and Landscapes from Antiquity to 1750	3
L A 381	Shaping the Land	3
L A 402	Urban Design	6
L A 404	Advanced Landscape Architectural Design	6
L A 444	Landscape Architecture Independent Educational Enrichment	R
L A 442	Professional Practice	2
L A 481	Landscape Construction	3
L A 482	Landscape Construction Documentation	3
DSN S 546	Interdisciplinary Design Studio	6
Plus nine credits professional electives		9

**Total Credits** **85**

### Electives: 12 credits

Complete electives sufficient to complete graduation requirements.

Landscape Architecture, B.L.A.

### First Year

Fall	Credits Spring	Credits
DSN S 102 or 131	4 DSN S 131 or 102	4
DSN S 115	1 DSN S 132	1
DSN S 183 ( or General Education)	3 Soc. Sciences/Humanities Elective	3
ENGL 150 or 250	3 Science Elective or MATH 142	3
Soc. Sciences/Humanities Elective	3 LIB 160	1
MATH 145	3 Elective (Optional for pre-professional year; not required for program application. If not taken in first year, add 3 cr. to a subsequent semester to meet the 150.0 credit total)	3

**17** **15**

### Second Year

Fall	Credits Spring	Credits
L A 201	6 L A 202	6
L A 211	3 L A 274	3
L A 221	3 ENV S 120	3
L A 241	1 Elective	3
L A 272	3	
<b>16</b>		<b>15</b>

### Third Year

Fall	Credits Spring	Credits
L A 301	6 L A 302	6
L A 322	3 L A 341	1
L A 373	3 L A 371	3
L A 381	3 Social Science/Humanities Electives	3
ENGL 250	3 Math/Science Elective	3
<b>18</b>		<b>16</b>

### Fourth Year

Fall	Credits Spring	Credits
L A 402	6 One of the following:	
L A 481	3 L A 444A	R
Social Science/Humanities Elective	3 L A 444B	R
LA electives	3 L A 444C	R
Communications (300 level English)	3	
DSN S 301 (Rome option only)	1	
<b>19</b>		<b>0</b>

### Fifth Year

Fall	Credits Spring	Credits
L A 404	6 DSN S 546	6
LA Electives	3 L A 442	2
LA Electives	3 L A 482	3
Social Science/Humanities Elective (300 level)	6 Electives/LA Electives	3
	Professional Elective	1
<b>18</b>		<b>15</b>

Additionally: Each student needs to take 3 credits of a US Diversity and 3 credits of an International Perspectives course (usually covered

by L A 373). Students also need to take at least 6 credits of 300 level or above in the combined areas of communication, science, math, humanities, and social science (6 total from all the areas).

## Graduate Programs

The department offers the Master of Landscape Architecture (MLA), an accredited professional degree designed for students with or without an undergraduate degree in landscape architecture. The degree provides skills and knowledge as measured by the Landscape Architectural Accreditation Board (LAAB) and the licensing exam for students seeking to practice as a licensed professional in the public or private sectors. The MLA degree also offers competency for students interested in post-professional study as it provides the skills and knowledge for the application of research and/or scholarly methods to professional practice.

The MLA program offers three concentration tracks in the following topical areas — Theory/Urbanism, Technology/Ecology, Advocacy/Community — through coursework and an optional thesis or creative component. The concentration in one of the three tracks will be determined by the student in consultation with his/her advisor. Concentration electives may be selected from within the college and university from an approved list and up to three (3) credits from within the department. In their final year, students may undertake a creative component or thesis option with the approval of their major professor and the department Graduate Committee.

Students are also able to pursue double degrees with Master of Community and Regional Planning (MLA/MCRP), Master of Urban Design (MLA/MUD), and Master of Design in Sustainable Environments (MLA/MDesSE). Students interested in the double-degree programs should contact the departments to receive a detailed description of requirements.

The department also offers courses in the Graduate Certificate Program in Geographic Information Systems (GIS), administered by the Department of Community and Regional Planning.

### Design and Planning: 34 credits

L A 601 Design Representation	4
L A 602 Studio I – Land/Form & Plant/Scape	6
L A 603 Studio II – Living Systems	6
L A 604 Studio III – City Matters	6
L A 605 Studio IV – LandWorks/LandDigits	6
DSN S 546 Interdisciplinary Design Studio	6

or 2 cr. L A 580 Thesis, Creative Comp. Tutorial + 4 cr. L A 599 Creative Comp. or L A 699 Thesis

### Theory/History/Research: 10 credits

L A 571 Landscape Architectural Theory	3
L A 590D Special Topics: History/Theory/Criticism	3
or L A 578D: LA History elective*	
L A 541 Design Inquiry	3
L A 543 Colloquium: Landscape Architecture Research	1

### Technology/Ecology/Materiality: 14 credits

L A 522 Advanced Plant Technology	3
L A 542 Professional Practice	2
L A 559 Digital Design Methods for Landscape Architecture	3
L A 583 Landscape TopoGraphics	3
L A 587 Landscape Construction	3

### Advocacy/Planning/Policy: 6 credits

L A 594 Environmental Justice in Built Environments	3
Planning Elective - choose one from:	3
C R P 566 Policy Analysis and Planning	
C R P 568 Planning and Development	
C R P 591 Environmental Law and Planning	
C R P 592 Land Use and Development Regulation Law	

### Concentration Electives: 15 credits

Concentration track electives in Theory/History/Urbanism; Advocacy/Planning/Community; Technology/Ecology/Materiality from approved list. Students may in consultation with their advisor also choose courses from CRP, ARCH, MUD, SUS E, IND D, or other relevant departments in the college or university.

### Total 80 credits

## Sustainable Environments

### Master of Design in Sustainable Environments

The Master of Design in Sustainable Environments (MDesSE) is an initial interdisciplinary degree that focuses on holistic design strategies for the production of sustainable, resilient environments and artifacts. MDesSE students and faculty constitute a multidisciplinary, highly interactive community that is deeply engaged in understanding, promoting, and conceiving sustainable practices in design, planning, and artistic production. Students from a variety of backgrounds such as design, art, planning, education, engineering, science, etc., engage in research projects and are challenged to develop individual sustainable design strategies for issues of current relevance that conserve resources, ameliorate ecological problems, and promote social, political, and economic justice.

Coursework focuses on developing skills in modes of representation and information dissemination; foundational and emerging theoretical discourse; as well as research methods and design interventions. The degree concludes with an integrated capstone experience through a student-defined thematic project. Capstone projects are situated in different parts of the world and include themes that draw upon each student's specific area of interest while being informed by the theories, skills, methods, and tactics learned throughout the MDesSE program.

The Master of Design in Sustainable Environments degree consists of 35 credits, typically distributed over three semesters (fall, spring, and summer); however, students may choose to distribute these credits over four or five semesters. The degree is geared toward students with professional degrees in art (BFA, MFA), architecture (BArch, MArch), graphic design (BFA, MFA), interior design (BFA, MFA), industrial design (BID, MID), landscape architecture (BLA, MLA), community and regional planning (BSCR, MCRP, MUP), or engineering. Graduate students can also pursue the following double degrees in the College of Design: MArch/MDesSE, MCRP/MDesSE, MFA in IVA/MDesSE and MLA/MDesSE.

**Courses primarily for graduate students, open to qualified undergraduates:**

#### **SUS E 501: Sustainable Design in Communities**

Cr. 5.

*Prereq: Graduate or senior status with instructor approval*

Exploring the challenges faced in implementing social, environmental, and economic sustainable solutions, this studio engages students in an interdisciplinary, team-oriented, and project-based learning environment through engagement with a Central Iowa community.

#### **SUS E 502: Sustainable Design Capstone Studio**

(0-12) Cr. 6.

*Prereq: Graduate or senior status with permission of instructor*

This advanced studio provides a community-based context for an interdisciplinary design team to work on a variety of self-directed, applied design research and intervention projects at multiple scales. Students utilize a common theoretical framework to organize their research and inform their interventions. Field trips.

#### **SUS E 511: Sustainable Design Colloquium I**

(3-0) Cr. 3.

*Prereq: Admission to MDSE program*

Study and discuss practices of sustainable design and design research. Investigate responsibilities, roles, technologies and methods for studying and advancing the art and science of designing sustainable environments.

#### **SUS E 512: Sustainable Design Seminar**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Students begin design research in sustainability issues by learning how to build a network of professional and academic contacts related to their individual research topics. Assignments include developing and engaging in an immersion experience related to their research.

#### **SUS E 513: Sustainable Design Research Writing**

(3-0) Cr. 3.

*Prereq: Graduate standing or permission of instructor*

Students develop a comprehensive and conclusive research manuscript for submission to a conference or journal in their discipline. SUS E student manuscripts detail their capstone projects. Non-majors compose papers detailing completed research projects in their own discipline.

#### **SUS E 521: Foundation of Sustainable Design**

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

Introduction to the broad frameworks and tools for implementing sustainability among a variety of environments, industries, and enterprises. Investigates the role and opportunity for sustainable design strategies.

#### **SUS E 531: Human Dimensions of Sustainability**

(3-0) Cr. 3.

*Prereq: Graduate or senior status or instructor permission*

This interdisciplinary seminar uses applied research with communities to ground students in the issues and conditions impacting social and economic sustainability. Students develop a broad understanding of community sustainability through weekly readings, discussions, and small made objects. Topics of focus include university-community partnerships, participatory design, and social constructions of sustainability.

#### **SUS E 540: Methods for Sustainable Design**

(3-0) Cr. 3. S.

*Prereq: senior or graduate standing.*

Overview of qualitative, quantitative and design research methods. In-depth application of methods relevant to capstone project proposal development (SUS E 502). Proposal must address research questions, articulation of research methods and preliminary findings grounded within contemporary theoretical discourse on Sustainable Environments.

**SUS E 550: Making Resilient Environments**

(Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: senior or graduate standing.*

Major theories and ideas revolving around the concept of resilience. Assessing the social and political processes associated with policy making for resilience. Application of the concept of resilience in order to understand and evaluate environments. Evaluate the different approaches toward resilience and develop an understanding of the relationship between sustainability and resilience. Case studies of communities that proactively prepare for, absorb, recover from, and adapt to actual or potential future adverse events.

## Urban Design

The Master of Urban Design (M.U.D.) is an initial, interdisciplinary program of study that focuses on contemporary challenges of urbanism at local, regional and global scales. Courses are taught by faculty from Architecture, Community and Regional Planning, and Landscape Architecture; with an understanding that urban environments should be engaged through an integrated design process that includes ecological, social, material, economic, and urban policy factors.

The urban design degree reflects a deep commitment to resilient urban environments within the context of an increasingly concentrated, connected and, diverse urban world. Accordingly, the coursework engages emerging urbanization topics including:

- The formation of more adaptable, flexible and resilient cities;
- the exponential growth of megacities and steady decline of investments in traditional urban economies in the twenty-first century;
- The transformation of Industrial landscapes, particularly within the Midwestern context, and the global impact of transnational economic operations.
- the spatialization of informal economies, practices, and services across the south-north global divide;
- and, a reexamination of the potentials of hard and soft infrastructures, principles of the circular economy and a reframing of the urban-rural divide.

The program consists of 30 credits, typically distributed over three semesters (fall, spring and summer), however, students may choose to distribute these credits over four or five semesters. The degree is geared toward students with professional degrees in architecture (BArch, MArch), landscape architecture (BLA, MLA) or planning (BSCR, MCRP, MUP). Graduate students can also pursue the following double degrees in the College of Design: M Arch/MUD, MCRP/MUD and MLA/MUD.

## Requirements:

URB D 501	Urban Design Local Studio	6
URB D 502	Urban Design Global Studio	6
History/Theory/Criticism		6
Technology/Methods		12
<b>Total Credits</b>		<b>30</b>

### List of Courses:

#### History/Theory/Criticism - 6 credits from the following list

ARCH 527	History, Theory, and Criticism of Chinese Architecture	3
ARCH 528A	Studies in Architecture: Culture	2-3
ARCH 575	Contemporary Urban Design Theory	3
ARCH 597	Seminar on the Built Environment III: Theory	3
ARCH 598	Seminar on the Built Environment IV: Topical Study	3
ART H 501	Issues in Visual and Material Culture Seminar	3
ART H 587	Nineteenth Century Art	3
ART H 588	Modern Art and Theory	3
ART H 592	Art History in Europe	3
ART H 594	Women/Gender in Art	3
ART H 595	Art and Theory Since 1945	3
ART H 596	History of Photography	3
ART H 597	Green Art: Earthworks and Beyond	3
C R P 529	Planning in Developing Countries	3
C R P 561	Planning Theory	3
C R P 563	Planning the American Metropolis	3
L A 578D	Topical Studies in Landscape Architecture: History/Theory/Criticism	2-3
URB D 511	North American Urbanization	3
URB D 521	Foundations of Urban Design	3
URB D 522	Contemporary Urban Design Practices	3
URB D 531	Methods of Urban Design Workshop	3
URB D 533	Urbanism Theory and Methods	3

#### Technology/Methods - 12 credits from the following list

ARCH 432	Advanced Computer Lighting and Rendering	3
ARCH 434	Advanced Computer-aided Architectural Design	3
ARCH 533	Digital Fabrication	3
ARCH 534	Topics in Computer-aided Architectural Design	3
ARCH 536	Advanced Design Media	3
ARCH 558	Sustainability and Green Architecture	3
ARTGR 573	Multimedia Design	3
ARTGR 578	Graphic Design Advanced Web Design	3
ARTGR 579	Wayfinding Design	3

ARTIS 408	Principles of 3D Animation	3	Select from	3
ARTIS 493C	Workshop: Computer Art and Design	1-3	Technology/ Methods List	
ARTIS 507	Principles of Character Animation	3		
ARTIS 508	Computer Aided Animation and Visualization	3		
ARTIS 509	Computer/Video Game Design and Development	3		
ARTIS 548	Digital Textile Design	3		
ARTIS 556	Relief Printmaking: Digital/Traditional	3-4		
ARTIS 557	Intaglio and Monotype Printmaking: Digital / Traditional	3-4		
ARTIS 558	Lithography: Digital / Traditional	3		
C R P 551	Introduction to Geographic Information Systems	3		
C R P 552	Geographic Data Management and Planning Analysis	3		
C R P 553	Analytical Planning/GIS	3		
C R P 556	GIS Programming and Automation	3		
C R P 595	Seminar in GIS Applications/Research	1		
DSN S 501	Introduction to Research Design	3		
IND D 640	Advanced Digital Technologies	3		
L A 558	Web Mapping and Spatial Data Visualization	3		
L A 578G	Topical Studies in Landscape Architecture: Graphics	2-3		
L A 578K	Landscape Architecture: Computer Applications	2-3		
L A 578L	Topical Studies in Landscape Architecture: Ecological Design	2-3		
URB D 532	Urban Design Media Workshop	3		

### First Year

Fall	Credits	Spring	Credits	Summer	Credits
Select from History/ Theory/ Culture List		3 URB D 501		6 URB D 502	6
Select from Technology/ Methods List		3 Select from Technology/ Methods List		3	
Select from Technology/ Methods List		3 Select From History/ Theory/ Culture		3	

# COLLEGE OF ENGINEERING

W. Samuel Easterling, James L. and Katherine S. Melsa Dean of Engineering

Arun Somani, Senior Associate Dean

Sriram Sundararajan, Associate Dean for Academic Affairs

Connie Hargrave, Associate Dean for Equity and Engagement

Sri Sritharan, Assistant Dean for Research

[www.engineering.iastate.edu](http://www.engineering.iastate.edu) (<http://www.engineering.iastate.edu/>)

## Aligning Education in Engineering with the University Mission

The mission of Iowa State University is to create, share, and apply knowledge to make Iowa and the world a better place. Students will become broadly educated, global citizens who are culturally informed, technologically adept, and ready to lead. The College of Engineering echoes this philosophy and emphasizes preparing its graduates to meet the challenges of the 21st century.

Engineering education seeks to develop a capacity for objective analysis, synthesis, and design to obtain a practical solution. The engineering programs at Iowa State University are designed to develop the professional competence of a diverse student body and, by breadth of study, to prepare students to solve the technical problems of society while considering the ethical, social, and economic implications of their work at state, national and global levels.

The focus of each curriculum is to strengthen students' critical thinking, creative abilities, and communication skills. Students in engineering will have the opportunity for interdisciplinary and experiential learning through learning communities, service learning, internships and cooperative education, as well as research, capstone, and study abroad experiences.

The problem-solving skills learned from an engineering education at Iowa State University also provide an excellent launching pad for careers not only in engineering, but also medicine, law, business, and many other fields.

Registration as a professional engineer, which is granted by each individual state, is required for many types of positions. The professional curricula in engineering at Iowa State University are designed to prepare a graduate for subsequent registration in all states.

Seniors in accredited curricula of the College of Engineering are encouraged to take the Fundamentals of Engineering Examination toward professional registration during their final academic year. Seniors in engineering curricula who have obtained at least 6 semester credits

in surveying may take the Fundamentals Examination for professional registration as land surveyors.

## Concurrent Graduate/ Undergraduate Programs

Several engineering programs offer the opportunity for well-qualified undergraduate juniors and seniors to pursue a graduate degree in their program while finishing the undergraduate requirements. The programs offering concurrent undergraduate/graduate degrees are: aerospace engineering, agricultural engineering, biological systems engineering, chemical engineering, civil engineering, computer engineering, electrical engineering, industrial engineering, materials engineering, mechanical engineering and software engineering.

Programs offering concurrent bachelor of science/master of business administration degrees are: aerospace engineering, agricultural engineering, biological systems engineering, chemical engineering, civil engineering, computer engineering, construction engineering, electrical engineering, industrial engineering, materials engineering, mechanical engineering and software engineering. For more information, refer to the graduate study sections for each engineering program. Advanced work in engineering is offered in the post-graduate programs. See the Graduate College section of this catalog.

## Joint Undergraduate Programs

A bachelor of science degree in software engineering is offered in the College of Engineering and the College of Liberal Arts and Sciences.

## Accreditation

Thirteen undergraduate engineering programs are accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org> (<http://www.abet.org/>). These thirteen programs are: aerospace, agricultural, biological systems, chemical, civil, computer, construction, cyber security, electrical, industrial, materials, mechanical and software engineering. Accreditation status is indicated in the Courses and Programs section for each engineering program.

## Organization of Curricula

All curricula in engineering are designed as four-year programs. They are structured in two phases: a basic program and a professional program. The basic program consists primarily of subjects fundamental and common to all branches of engineering and includes chemistry, physics, mathematics, engineering computations, and English. The professional phase of a curriculum includes intensive study in a particular branch of engineering, as well as a continuation of supporting work in mathematics, basic sciences, humanities, and social sciences.

Students should complete the requirements of the basic program before proceeding to a professional program.



## Preparation for the Engineering Curricula

In addition to the freshman admission requirements for direct from high school students, the college also requires 2 years of a single foreign language. Students coming in without the 2 years of a single foreign language must meet this requirement by no later than the time of graduation. Other high school credits particularly important to students wishing to study engineering include:

- 2 years of algebra,
- 1 year of geometry
- 1/2 year of trigonometry
- 1/2 year of pre-calculus
- 1 year each of chemistry, biology, and physics
- 3 years of social science
- 4 years of English

See Index (<http://catalog.iastate.edu/azindex/>) for specific admission requirements.

Placement in mathematics, English, and chemistry will generally be based on high school preparation and test scores. Advanced placement is possible for exceptionally well-prepared students. Students who are not adequately prepared may be encouraged or required to take additional preparatory coursework and should expect to spend more than the customary time to complete the engineering program. Any coursework which is preparatory or remedial in nature cannot be used to satisfy credit requirements for graduation in any of the engineering curricula.

## Engineering Basic Program

Please see "Basic Program for Engineering Curricula" section.

## Requirement for Graduation

In order to graduate in a professional engineering curriculum, students must have a minimum GPA of 2.00 in a department-designated group of 200-level and above courses known as the Core. These courses will total no fewer than 24 semester credits.

## Engineering Minors

The College of Engineering offers five undergraduate minors which are open only to students in the College of Engineering. These are minors in biomedical engineering, cyber-physical systems, energy systems, engineering sales and nondestructive evaluation. These minors must include at least nine credits which are beyond the total used to meet curriculum requirements.

The biomedical engineering minor is a 17-credit interdisciplinary program that complements a student's major discipline by providing additional insight into the interactions between various engineering disciplines

and biomedically-relevant systems. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Biomedical Engineering in Courses and Programs.

The energy systems engineering minor is a 15 credit program that provides engineering students with focused educational opportunities in the broad area of energy systems. Students will understand broad energy perspectives, the language of energy systems and the economic, environmental, and policy issues related to energy. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Energy Systems Engineering in Courses and Programs or see <http://www.me.iastate.edu/energy-systems-minor/>.

The engineering sales minor is a 15 credit minor that complements the technical training in the student's major discipline by providing the tools and knowledge required for technical (i.e. business-to-business) sales careers. The minor is administered by a supervisory faculty committee. For minor course requirements, refer to Engineering Sales in Courses and Programs.

The nondestructive evaluation minor (16 credit minimum) open to engineering students who have met the basic program requirements and are not on academic warning or probation. The minor is supervised by an inter-disciplinary Engineering faculty committee. For minor course requirements, refer to Nondestructive Evaluation Engineering in Courses and Programs.

## Engineering Minor (Interdisciplinary)

The College of Engineering offers an undergraduate minor in cyber security which is open to all students at ISU who meet the prerequisites. The cyber security minor is a 15 credit minor that is intended for students studying computer engineering, computer science, software engineering or management information systems with the goal of enabling them to work in cyber security. For minor course requirements, refer to the Cyber Security in Courses and Programs.

## Undergraduate Majors and Minors Outside the College of Engineering

In addition to the engineering degree program, students may earn majors or minors in other colleges of the university. A major or minor program must meet all requirements of the offering department or program and its college and contain credits beyond the requirements for a B.S. degree in engineering. A minimum of 15 additional credits is required for each major area of study and an additional 9 credits for each minor.

## Advising System

The purpose of the advising system in the College of Engineering is to work constructively with students in developing their individual academic

programs and to provide a resource contact person for students during their college careers.

The college offers an orientation program during the spring and summer for students planning to enter in the fall, and during the fall for students planning to enter in the spring. Students may also complete orientation online. All entering students are encouraged to attend orientation which includes meeting with an academic advisor to register for classes.

Placement assessments given during the orientation program help determine the student's current level of proficiency which enables the academic advisor to prepare an appropriate course schedule for the student.

## Special Programs

All engineering students are strongly encouraged to participate in either the cooperative education or internship programs. Students who are qualified to participate in the engineering honors program are also urged to do so. These programs are integrated into the professional engineering curricula and may require additional work. However, both these professional and academic programs offer opportunities that will enrich the standard academic experience. Engineering students are also encouraged to take advantage of study abroad opportunities available through the College of Engineering's International Programs Office.

a. Cooperative Education Program. The College of Engineering offers, through its curricula, an experiential education program. Enrollment in the program allows students to gain practical work experience in their career field while attending college. In general, students enrolled in the co-op program will require an additional semester to complete curriculum requirements.

Cooperative programs are a mechanism by which a student may work full-time for one semester per academic or calendar year. The student has the opportunity to assess career paths within her/his chosen curriculum and the employer evaluates the student's potential as a future full-time employee. Both domestic and international co-op programs are allowed. Cooperative education students pay no tuition to the university during their work periods and do not receive credit hours for their work experience. Students register for a non-credit cooperative education course (398) for fall or spring and are considered full-time students while enrolled in these courses. For additional information contact your academic advisor and the Office of Engineering Career Services.

b. Internship Program. The College of Engineering offers, through its curricula, an experiential education program. Internships are a mechanism by which a student may work full-time for the summer.

Enrollment in the program allows students to gain practical work experience in their career field while attending college.

Internship students pay no tuition to the university during their work periods and do not receive credit hours for their work experience. Students who register for the internship course (396) for the summer are

considered to be full-time students. For additional information contact your academic advisor and the Office of Engineering Career Services.

c. Honors Program. The College of Engineering participates in the University Honors Program (see Index (<http://catalog.iastate.edu/azindex/>)). The honors program is designed for students with above average ability who wish to individualize their programs of study. For further details consult the chair of the Engineering College Honors Program Committee or your departmental honors program advisor.

d. Engineering International Engagement. In a world where the sun never sets, engineers must be prepared to understand other cultures and other ways of doing business. Engineers must expand their exportable skills, language and cross-cultural skills.

The College of Engineering has formed worldwide partnerships to create opportunities for students to work and study with leading universities in other countries and multinational corporations. With careful planning, students may earn credit in courses that fulfill their degree requirements. To learn more about work and study abroad, visit the Engineering International Engagement website: <http://www.engineering.iastate.edu/studyabroad/>

## Departments of the College

For information on undergraduate options refer to the following curriculum sections, and for graduate specializations or certificate programs, refer to the Courses and Programs section of the catalog.

- Aerospace Engineering
- Agricultural and Biosystems Engineering
- Chemical and Biological Engineering
- Civil, Construction and Environmental Engineering
- Electrical and Computer Engineering
- Industrial and Manufacturing Systems Engineering
- Materials Science and Engineering
- Mechanical Engineering

## Degree Programs

Aerospace Engineering  
 Agricultural Engineering  
 Biological Systems Engineering  
 Chemical Engineering  
 Civil Engineering  
 Computer Engineering  
 Construction Engineering  
 Cyber Security Engineering  
 Electrical Engineering  
 Engineering Mechanics  
 Environmental Engineering

- Industrial Engineering
- Materials Engineering
- Materials Science and Engineering
- Mechanical Engineering
- Software Engineering
- Systems Engineering

Minors

- Biomedical Engineering
- Cyber-Physical Systems (<https://www.engineering.iastate.edu/cps-minor/>)
- Cyber Security
- Energy Systems Engineering
- Engineering Sales
- Non-Destructive Evaluation Engineering

Engineering

Engineering

Two Bachelor's Degrees versus a Degree and Second Major

A student with multiple curricula within the College of Engineering is permitted to earn only multiple degrees. All requirements for each curricula must be met plus an additional 30 credits for each curricula being pursued beyond the curriculum which requires the most credits.

Students in the College of Engineering are able to earn a degree with a second major/curriculum as long as the second major/curriculum is within another college, meets all requirements of the additional programs and contains a minimum of 15 additional credits beyond the requirements for a B.S. degree in engineering for each additional area of study.

Basic Program for Engineering Curricula

The Basic Program is a set of courses that provides a foundation common to all engineering curricula. Students normally enroll in most of the Basic Program courses during their first year. Before enrolling in engineering courses at the 200-level and above, students enrolled in the College of Engineering must do the following:

1. Complete the Basic Program with a Basic Program grade point average (GPA) of at least 2.00.
2. Earn an ISU cumulative GPA of at least 2.00.

A grade of C or better is required for any transfer credit course applied to the Basic Program. Grades from transfer courses will not be used in computing the Basic Program GPA.

Students enrolled in the College of Engineering who have not met the above requirements may enroll for no more than two semesters in

200-level engineering courses. Students not enrolled in the College of Engineering may take engineering courses as long as they meet the prerequisites and space is available; only the first two semesters of engineering courses at the 200-level and above taken at ISU while a student is not enrolled in the College of Engineering can be applied toward an engineering degree.

Entering undergraduates must demonstrate proficiency in trigonometry based on test scores, or by having transfer credits from a college trigonometry course, or by passing MATH 143 Preparation for Calculus before enrolling in MATH 165 Calculus I.

The Department of English may recommend placement in one or more sections of ENGL 099 or ENGL 101 English for Native Speakers of Other Languages if the placement test administered to students whose first language is not English indicates deficiencies. Satisfactory completion of the recommended English course(s) will be required of students to complete their Basic Program.

Basic Program

(A minimum GPA of 2.00 required for this set of courses. Transfer courses are not used in the Basic Program GPA computation).

MATH 165	Calculus I	4
MATH 166	Calculus II	4
ENGL 150	Critical Thinking and Communication (Must have a C or better)	3
CHEM 167 or CHEM 177 or CHEM 201	General Chemistry for Engineering Students General Chemistry I Advanced General Chemistry	4-5
ENGR 101	Engineering Orientation *	R
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
LIB 160	Introduction to College Level Research	1
ENGR 160	Engineering Problems with Computer Applications Laboratory	3
Or one of the following in place of ENGR 160		
AER E 160	Aerospace Engineering Problems With Computer Applications Laboratory	
A B E 160	Systematic Problem Solving and Computer Programming	
C E 160	Engineering Problems with Computational Laboratory	
CH E 160	Chemical Engineering Problems with Computer Applications Laboratory	
CPR E 185	Introduction to Computer Engineering and Problem Solving I	

E E 185	Introduction to Electrical Engineering and Problem-Solving I	
I E 148	Information Engineering	
M E 160	Mechanical Engineering Problem Solving with Computer Applications	
S E 185	Problem Solving in Software Engineering	
<b>Total Credits</b>		<b>24-25</b>

ENGL 250 Written, Oral, Visual, and Electronic Composition is normally taken in the second year. With advanced placement to ENGL 250, credit for ENGL 150 Critical Thinking and Communication is earned upon successful completion of ENGL 250 Written, Oral, Visual, and Electronic Composition, but only when ENGL 250 Written, Oral, Visual, and Electronic Composition is completed at Iowa State.

\* Students enrolled in the joint software engineering degree program should take S E 101 Software Engineering Orientation, note that ENGR 101 can be substituted for S E 101.

## Aerospace Engineering Undergraduate Study

For undergraduate curriculum in aerospace engineering leading to the degree bachelor of science. The Aerospace Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>.

The aerospace engineer is primarily concerned with the design, analysis, testing, and overall operation of vehicles which operate in air and space. The curriculum is designed to provide the student with an education in the fundamental principles of aerodynamics, flight dynamics, propulsion, structural mechanics, flight controls, design, testing, and space technologies. A wide variety of opportunities awaits the aerospace engineering graduate in research, development, design, production, sales, and management in the aerospace industry, and in many related industries in which fluid flow, control, structural, and transportation challenges play major roles.

Make To Innovate (M:2:I) is an exciting new program in the Aerospace Engineering Department that engages students in hands-on projects to augment their understanding of engineering fundamentals.

A cooperative education program in aerospace engineering is available in cooperation with government agencies and industry. The usual four-year curriculum is extended for students who participate in alternating industrial experience periods and academic periods. This arrangement offers valuable practical experience and financial assistance during the college years.

## Undergraduate Mission and Educational Objectives

The Department of Aerospace Engineering maintains an internationally recognized academic program in aerospace engineering via ongoing consultation with students, faculty, industry, and aerospace professionals. Results of these consultations are used in a process of continuous academic improvement to provide the best possible education for our students.

### Mission statement:

The mission of the aerospace engineering program is to prepare the aerospace engineering student for a career with wide-ranging opportunities in research, development, design, production, sales, and management in the aerospace industry and in the many related industries which are involved with the solution of multi-disciplinary, advanced technology problems.

### Program Educational Objectives:

The objectives of the Aerospace Engineering program at ISU are to produce graduates:

- who actively contribute to the field of aerospace, related fields or other disciplines;
- are critical thinkers and lifelong learners; and
- are aware of the societal, economic and environmental impact of their work.

## Student Learning Outcomes

Upon graduation, students should have:

- an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- an ability to communicate effectively with a range of audiences
- an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## CURRICULUM IN AEROSPACE ENGINEERING

Leading to the degree bachelor of science.

### TOTAL CREDITS REQUIRED: 129.0.

Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements for either required or elective courses.

### INTERNATIONAL PERSPECTIVES <sup>1</sup>: 3 CR.

### U.S. DIVERSITY <sup>1</sup>: 3 CR.

### COMMUNICATION PROFICIENCY/LIBRARY REQUIREMENT:

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Proposal and Report Writing (C or better in this course)	

### GENERAL EDUCATION ELECTIVES: 12.0 CR. <sup>2</sup>

Complete 12 cr. General Education Electives are requirements for graduation so may not be taken on a P-NP basis.

### BASIC PROGRAM: 24 CR.

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
AER E 160	Aerospace Engineering Problems With Computer Applications Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4

PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### MATH AND PHYSICAL SCIENCE: 12 CR.

MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
PHYS 232	Introduction to Classical Physics II	4
<b>Total Credits</b>		<b>12</b>

### AEROSPACE ENGINEERING CORE: 47 CR.

A minimum GPA of 2.00 required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Core GPA):

AER E 261	Introduction to Performance and Design	3
AER E 310	Aerodynamics I: Incompressible Flow	3
AER E 311	Aerodynamics II: Compressible Flow	3
AER E 321	Flight Structures Analysis	3
AER E 331	Flight Control Systems I	3
AER E 322	Aerospace Structures Laboratory	2
AER E 344	Aerodynamics and Propulsion Laboratory	3
AER E 351	Astrodynamics I	3
AER E 355	Aircraft Flight Dynamics and Control	3
AER E 411	Aerospace Vehicle Propulsion	3
AER E 415	Rocket Propulsion	3
or AER E 433	Spacecraft Dynamics and Control	
AER E 421	Advanced Flight Structures	3
AER E 461	Modern Design Methodology with Aerospace Applications	3
AER E 462	Design of Aerospace Systems	3
E M 324	Mechanics of Materials	3
M E 231	Engineering Thermodynamics I	3
<b>Total Credits</b>		<b>47</b>

### OTHER REMAINING COURSES: 34 CR.

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
C E 274	Engineering Statics	3
M E 345	Engineering Dynamics	3
MAT E 273	Principles of Materials Science and Engineering	3
AER E 161	Numerical, Graphical and Laboratory Techniques for Aerospace Engineering	4
AER E 361	Computational Techniques for Aerospace Design	3
AER E 362	Aerospace Systems Integration	3
3 credits from the following		3

any AER E or EM graduate level (500+ level) course

AER E 407	Applied Formal Methods	
AER E 412	Spacecraft Electric Propulsion	
AER E 415	Rocket Propulsion	
AER E 417	Experimental Mechanics	
AER E 422	Vibrations and Aeroelasticity	
AER E 423	Composite Flight Structures	
AER E 426	Design of Aerospace Structures	
AER E 432	Flight Control Systems II	
AER E 433	Spacecraft Dynamics and Control	
AER E 442	V/STOL Aerodynamics and Performance	
AER E 445	Experimental Flow Mechanics and Heat Transfer	
AER E 446	Computational Fluid Dynamics	
AER E 448	Fluid Dynamics of Turbomachinery	
AER E 451	Astrodynamics II	
AER E 452	Introduction To Systems Engineering And Analysis	
AER E 463	Introduction to Multidisciplinary Design Optimization	
AER E 464	Spacecraft Systems	
AER E 468	Large-Scale Complex Engineered Systems (LSCES)	
AER E 480	Ultrasonic Nondestructive Evaluation	
AER E 483	Aeroacoustics	
One of the following:		3
ENGL 314	Technical Communication (Must have a C or better in this course)	
ENGL 309	Proposal and Report Writing (Must have a C or better in this course)	
Technical Electives (see below) <sup>2</sup>		3
Career Electives (see below) <sup>2</sup>		3
<b>Total Credits</b>		<b>34</b>

Technical Electives, 3 cr. and Career Electives, 3 cr. selected from preceding Aer E list or departmental-approved 300-level or above courses relevant to technical and career areas.

#### Seminar/Co-op/Internships/Flight Experience:

AER E 192	Aerospace Seminar	R
AER E 301	Flight Experience	R

Co-op and internships are optional

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also allowed by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.

2. Choose from department approved list. ([http://www.aere.iastate.edu/students/undergraduate\\_program/](http://www.aere.iastate.edu/students/undergraduate_program/))
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also: A 4-year plan of study grid showing course template by semester.

## Aerospace Engineering, B.S.

### Freshman

Fall	Credits Spring	Credits
MATH 165	4 MATH 166	4
CHEM 167	4 PHYS 231	4
AER E 160	3 PHYS 231L	1
LIB 160	1 AER E 161	4
ENGL 150	3 General Education Elective	3
ENGR 101	R AER E 192	R
<b>15</b>		<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
MATH 265	4 MATH 267	4
PHYS 232	4 M E 345	3
MAT E 273	3 M E 324	3
C E 274	3 AER E 261	3
ENGL 250	3 ENGL 314 or 309	3
<b>17</b>		<b>16</b>

### Junior

Fall	Credits Spring	Credits
AER E 321	3 AER E 421	3
AER E 322	2 AER E 361	3
M E 231	3 AER E 362	3
AER E 310	3 AER E 344	3
AER E 351	3 AER E 311	3
AER E 355	3 AER E 331	3
AER E 301	R	
<b>17</b>		<b>18</b>

### Senior

Fall	Credits Spring	Credits
Technical Elective	3 Technical Elective	3
AER E 461	3 Technical Elective	3
AER E 411	3 AER E 462	3
AER E 415 or 433	3 General Education Elective	3



General Education Elective	3 General Education Elective	3
	15	15

## Nondestructive Evaluation (NDE)

The NDE Minor ([http://catalog.iastate.edu/collegeofengineering/non\\_destructiveevaluationengineering/](http://catalog.iastate.edu/collegeofengineering/non_destructiveevaluationengineering/)) is multidisciplinary and open to undergraduates in the College of Engineering.

## BS/MS & BS/ME Degree Programs

The concurrent BS/MS & BS/ME (<https://www.aere.iastate.edu/graduate-students/concurrent-degrees/>) classification offers an opportunity for well-qualified Iowa State juniors and seniors to begin working on a master's degree before completing a bachelor's degree.

## Graduate Study

The department offers graduate programs that lead to the degrees master of engineering, master of science, and doctor of philosophy with major in aerospace engineering and minor work to students taking major work in other departments. For all graduate degrees, it is possible to establish a co-major program with another graduate degree-granting department. Within the aerospace program, students can specialize in one or more of the following areas: aerospace systems design, atmospheric and space flight dynamics, computational fluid dynamics, control systems, wind engineering, fluid mechanics, optimization, structural analysis, and non-destructive evaluation.

### Master of Science and Master of Engineering

The Master of Science degree requires a thesis and has strong research emphasis. The Master of Science degree is recommended for students who anticipate entering a doctoral program later. The Master of Engineering degree does not require either research credits or a thesis and is intended for students who do not anticipate pursuing a doctoral degree. The Master of Engineering degree can be completed with coursework only or with a combination of coursework and creative component. Credits for creative component will be obtained by registering for **AER E 599 Creative Component**. A written report and an oral presentation will be given to the student's graduate committee.

At least 30 credits of acceptable graduate work are required for both the Master of Science and the Master of Engineering degrees. For specific course, research, and creative component requirements, see the departmental Graduate Student Handbook (<http://www.aere.iastate.edu/files/2015/04/AerE-Graduate-Handbook-Revised-S15.pdf>).

### Bachelor of Science/Master of Science Concurrent Degree Program

The department offers concurrent BS/MS and BS/ME degree programs (<http://www.aere.iastate.edu/students/concurrent-degrees/>) and a

concurrent BS/MBA degree program which offer an opportunity for well-qualified Iowa State juniors and seniors to begin working on a master's degree before completing a bachelor's degree. The concurrent degree programs reduce by one year the normal time period for completing both degrees separately.

### Preparation for Graduate Work

The normal prerequisite for major graduate work in aerospace engineering is the completion of an undergraduate curriculum substantially equivalent to that required of aerospace engineering students at this university. Due to the diversity of interests of aerospace faculty, students whose prior undergraduate or graduate education has been in allied engineering and/or scientific fields may also qualify. In such cases, it may be necessary for the student to take additional work to provide the requisite aerospace background. A prospective graduate student is urged to specify the degree program and the specific field(s) of interest on the application for admission.

Courses are offered at the times stated in the course description. Where no specific time of offering is stated, the course may be offered during any semester provided there is sufficient demand.

### Graduate Minor Work

Minor work for aerospace engineering majors is usually selected from mathematics, physics, electrical engineering, engineering mechanics, mechanical engineering, materials science, meteorology, computer science, and computer engineering.

## Agricultural Engineering

For the undergraduate curriculum in agricultural engineering leading to the degree bachelor of science. The Agricultural Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>.

**Goal:** To educate students in the analysis and design of machinery, animal housing, and environmental systems for the production, processing, storage, handling, distribution, and use of food, feed, fiber and other biomaterials, and the management of related natural resources, by integrating basic physical and biological sciences with engineering design principles.

**Student Learning Outcomes:** Graduates of the Agricultural Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety,

and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** Three to five years after graduation, our graduates will be using the knowledge, skills, and abilities from their agricultural engineering degree to improve the human condition through successful careers in a wide variety of fields. They will be effective leaders, collaborators, and innovators who address environmental, social, technical, and business challenges. They will be engaged in life-long learning and professional development through self-study, continuing education, or graduate/professional school.

Graduates find employment in diverse ag- and bio-related industries and government agencies dealing with agricultural machines and buildings, animal and environmental control, grain processing and handling, soil and water resources, food, biorenewables, and biotechnology. Their work involves engineering design, development, testing, research, manufacturing, consulting, sales, and service. Students are highly encouraged to participate in either cooperative education or internship programs.

The department also offers a bachelor of science curriculum in biological systems engineering. Additionally, the department offers bachelor of science curricula in agricultural systems technology and in industrial technology.

Well-qualified juniors and seniors in agricultural engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue a bachelor of science degree in agricultural engineering and a master of science degree in agricultural engineering. A concurrent bachelor of science and master of business administration program is also offered by the department. Refer to Graduate Study for more information.

## Curriculum in Agricultural Engineering

Administered by the Department of Agricultural and Biosystems Engineering.

Leading to the degree bachelor of science.

### Total credits required:

**126.0 cr Land and Water Resources Engineering Option**

**128.0 cr Power and Machinery Engineering Option**

**128.0 cr Animal Production Systems Engineering Option.**

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs. International Perspectives: 3 cr.<sup>1</sup>**

**U.S. Diversity: 3 cr.<sup>1</sup>**

### Communication Proficiency/Library requirement :

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
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ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
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LIB 160	Introduction to College Level Research	1
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Communication Elective: One of the following (Must have a C or better in this course)	3
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AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences
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ENGL 309	Proposal and Report Writing
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ENGL 314	Technical Communication
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MKT 450	Advanced Professional Selling
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SP CM 212	Fundamentals of Public Speaking
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SP CM 312	Business and Professional Speaking
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### Social Sciences and Humanities: 12 cr.<sup>1,2</sup>

3 credits from international perspectives-university approved list	3
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3 credits from U.S. diversity-university approved list	3
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6 credits from Social Sciences and Humanities courses-department approved list	6
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<b>Total Credits</b>	<b>12</b>
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### Basic Program: 24 cr.

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section. Within the Agricultural Engineering Basic Program, students are required to complete CHEM 167 and CHEM 167L or the sequence of CHEM 177, CHEM 177L, and CHEM 178. This is a departmental requirement within the College of Engineering Basic Program requirements. CHEM 178 credits can then be applied to the Math/Science Elective within the options of Power and Machinery Engineering and Animal Production Systems Engineering of the Agricultural Engineering major requirements.

A B E 160	Systematic Problem Solving and Computer Programming <sup>3</sup>	3
CHEM 167	General Chemistry for Engineering Students	4
	or CHEM 177	
	and	
CHEM 178	General Chemistry II	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Math and Physical Science: 7 cr.**

CHEM 167L	Laboratory in General Chemistry for Engineering	1
	or CHEM 177L Laboratory in General Chemistry I	
MATH 266	Elementary Differential Equations	3
STAT 305	Engineering Statistics	3
<b>Total Credits</b>		<b>7</b>

**Ag Engineering Core: 35 cr.**

(A minimum GPA of 2.00 required for this set of courses, including any transfer courses please note that transfer course grades will not be calculated into the Core GPA).

A B E 216	Fundamentals of Agricultural and Biosystems Engineering	3
A B E 218	Project Management & Design in Agricultural and Biosystems Engineering	2
A B E 316	Applied Numerical Methods for Agricultural and Biosystems Engineering	3
A B E 363	Agri-Industrial Applications of Electric Power and Electronics	4
A B E 378	Mechanics of Fluids	3
A B E 404	Instrumentation for Agricultural and Biosystems Engineering	3
A B E 415	Agricultural & Biosystems Engineering Design I	2
A B E 416	Agricultural & Biosystems Engineering Design II	2
C E 274	Engineering Statics	3
E M 324	Mechanics of Materials	3
E M 327	Mechanics of Materials Laboratory	1
	or A B E 378L Mechanics of Fluids Laboratory	
I E 305	Engineering Economic Analysis	3

M E 231	Engineering Thermodynamics I	3
<b>Total Credits</b>		<b>35</b>

**Other Remaining Courses: 11 cr.**

A B E 110	Experiencing Agricultural and Biosystems Engineering	1
A B E 170	Engineering Graphics and Introductory Design	3
A B E 201	Preparing for Workplace Seminar	1
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
	Communication Elective: One of the following (Must have a C or better in this course)	3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
MKT 450	Advanced Professional Selling	
SP CM 212	Fundamentals of Public Speaking	
SP CM 312	Business and Professional Speaking	
<b>Total Credits</b>		<b>11</b>

Complete remaining courses from one of the following options:

**Land and Water Resources Engineering Option: 37 cr.**

A B E 431	Design and Evaluation of Soil and Water Conservation Systems	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
BIOL 251	Biological Processes in the Environment	3
	or BIOL 211	
C E 326	Principles of Environmental Engineering	3
C E 372	Engineering Hydrology and Hydraulics	3
GEOL 201	Geology for Engineers and Environmental Scientists	3
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1
A B E 273	CAD for Process Facilities and Land Use Planning	1
	GIS Elective (One of the following):	3
C R P 251	Fundamentals of Geographic Information Systems	
C R P 451	Introduction to Geographic Information Systems	
ENSCI 270	Geospatial Technologies	
GEOL 452	Intro GIS for Geoscientists	
NREM 345	Natural Resource Photogrammetry and Geographic Information Systems	

NREM 446	Integrating GPS and GIS for Natural Resource Management	
Subsurface Systems Elective (One of the following):		3
C E 360	Geotechnical Engineering	
C E 473	Groundwater Hydrology	
Water Quality Elective (One of the following):		3
A B E 432	Nonpoint Source Pollution and Control	
A B E 437	Watershed Modeling and Policy	
A B E Breadth (One of the following):		3
A B E 340	Functional Analysis of Soil, Crop, and Machine Systems	
A B E 380	Principles of Biological Systems Engineering	
A B E 424 (3 different 1cr modules)		
A B E 424A	Air Pollution: Air quality and effects of pollutants	
A B E 424B	Air Pollution: Climate change and causes	
A B E 424C	Air Pollution: Transportation Air Quality	
A B E 424D	Air Pollution: Off-gas treatment technology	
A B E 424E	Air Pollution: Agricultural sources of pollution	
A B E 469	Engineering for Grain Storage, Preservation, Handling, and Processing Systems	
A B E 472	Controlled Environments for Animals and Plants (offered Spring even years)	
A B E 478	Wood Frame and Agri-Industrial Structures (offered Spring odd years)	
A B E 480	Engineering Analysis of Biological Systems	
<b>Total Credits</b>		<b>37</b>
<b>Power and Machinery Engineering Option: 39 cr.</b>		
A B E 340	Functional Analysis of Soil, Crop, and Machine Systems	3
A B E 342	Agricultural Tractor Power	3
A B E 410	Electronic Systems Integration for Agricultural Machinery	3
A B E 413	Fluid Power Engineering	3
AGRON 182	Introduction to Soil Science	3
BIOL 251	Biological Processes in the Environment	3
or BIOL 211		
MAT E 273	Principles of Materials Science and Engineering	3
M E 324	Manufacturing Engineering	3
M E 324L	Manufacturing Engineering Laboratory	1
M E 325	Mechanical Component Design	3
M E 345	Engineering Dynamics	3
Computer Graphics (Two of the following):		2

A B E 271	Engineering Applications of Parametric Solid Modeling	
A B E 272	Parametric Solid Models, Drawings, and Assemblies Using Creo Parametric	
A B E 273	CAD for Process Facilities and Land Use Planning	
A B E Elective (One of the following):		3
A B E 431	Design and Evaluation of Soil and Water Conservation Systems	
A B E 469	Engineering for Grain Storage, Preservation, Handling, and Processing Systems	
A B E 472	Controlled Environments for Animals and Plants (offered Spring even years)	
A B E 478	Wood Frame and Agri-Industrial Structures (offered Spring odd years)	
A B E 480	Engineering Analysis of Biological Systems	
Math/Science Elective		3
AGRON 181	Introduction to Crop Science	
CHEM 178	General Chemistry II (In combination with CHEM 177)	
MATH 207	Matrices and Linear Algebra	
MATH 265	Calculus III	
PHYS 232	Introduction to Classical Physics II	
PHYS 232L	Introduction to Classical Physics II Laboratory	
<b>Total Credits</b>		<b>39</b>

**Animal Production Systems Engineering Option: 39 cr.**

A B E 327L	Animal Production Systems Design Lab	1
A B E 469	Engineering for Grain Storage, Preservation, Handling, and Processing Systems	3
A B E 472	Controlled Environments for Animals and Plants (offered Spring even years)	3
A B E 478	Wood Frame and Agri-Industrial Structures (offered Spring odd years)	3
BIOL 251	Biological Processes in the Environment	3
or BIOL 211		
C E 332	Structural Analysis I	3
C E 333	Structural Steel Design I	3
C E 334	Reinforced Concrete Design I	3
TSM 327	Livestock and Poultry Production: Facilities, Technology, and Management	3
Animal Science/Horticulture Elective (One of the following):		3
AN S 223	Poultry Science	
AN S 225	Swine Science	
AN S 226	Beef Cattle Science	

AN S 229	Sheep Science	
AN S 235	Dairy Cattle Science	
HORT 221	Principles of Horticulture Science	
Computer Graphics (One of the following):		1
A B E 271	Engineering Applications of Parametric Solid Modeling	
A B E 272	Parametric Solid Models, Drawings, and Assemblies Using Creo Parametric	
A B E 273	CAD for Process Facilities and Land Use Planning (Preferred)	
A B E elective (One of the following): <sup>2</sup>		3
A B E 431	Design and Evaluation of Soil and Water Conservation Systems	
A B E 340	Functional Analysis of Soil, Crop, and Machine Systems	
A B E 480	Engineering Analysis of Biological Systems	
Animal Production Systems Engineering Elective		4
C E 360	Geotechnical Engineering	
M E 436	Heat Transfer	
Math/Science Elective		3
AGRON 181	Introduction to Crop Science	
AGRON 182	Introduction to Soil Science	
CHEM 178	General Chemistry II (In combination with CHEM 177)	
GEOL 201	Geology for Engineers and Environmental Scientists	
HORT 332	Greenhouse and Nursery Operations and Management	
MATH 207	Matrices and Linear Algebra	
MATH 265	Calculus III	
PHYS 232	Introduction to Classical Physics II	
PHYS 232L	Introduction to Classical Physics II Laboratory	
<b>Total Credits</b>		<b>39</b>

**Co-op/Internships (Optional)**

- These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program.  
U.S. Diversity, International Perspectives and Social Science/ Humanities courses may not be taken Pass/Not Pass.
- Choose from department approved list. (<http://www.abe.iastate.edu/undergraduate-students/agricultural-engineering/ae-curricula/>)

- See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

**TRANSFER CREDIT REQUIREMENTS**

Students graduating with a degree in A E or BSE are required to have a minimum of 18 credits of 300-level and 400-level ABE courses taken at Iowa State University (excluding 490, 415, and 416), and must complete the two-semester ABE Capstone sequence (ABE 415 & 416) at Iowa State University. The Department of Agricultural & Biosystems Engineering requires a grade of C or better for any transfer credit course that is applied to the degree program.

See also: A 4-year plan of study grid showing course template by semester.

Agricultural Engineering, B.S. - power & machinery option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
CHEM 167	4 MATH 166	4
CHEM 167L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
	<b>16</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
MAT E 273	3 E M 324	3
AGRON 182	3 MATH 266	3
Math/Science Elective	3 STAT 305	3
	International Perspectives	3
	Elective	
	<b>15</b>	<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 340	3 A B E 316	3
A B E 363	4 A B E 342	3
E M 327 or A B E 378L	1 A B E 378	3
M E 231	3 M E 324L	1
M E 345	3 BIOL 251 or 211	3

Communication Elective	3 Computer Graphics Elective	2
	<b>17</b>	<b>15</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 415	2 A B E 416	2
A B E 404	3 A B E 410	3
A B E 413	3 A B E Elective	3
M E 324	3 I E 305	3
M E 325	3 Social Science or Humanities Elective	3
US Diversity Elective	3 Social Science or Humanities Elective	3
	<b>17</b>	<b>17</b>

Agricultural Engineering, B.S. - animal production systems engineering option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
CHEM 167	4 MATH 166	4
CHEM 167L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
	<b>16</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
MATH 266	3 M E 324	3
TSM 327	3 M E 231	3
A B E 327L	1 STAT 305	3
US Diversity Elective	3 BIOL 211 or 251	3
	<b>16</b>	<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 316	3 A B E 478	3
A B E 363	4 C E 333	3
A B E 378	3 I E 305	3
C E 332	3 Computer Graphics Elective	1
E M 327 or A B E 378L	1 Communication Elective	3

Math/Science Elective	3 International Perspective Elective	3
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**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 415	2 A B E 416	2
A B E 404	3 A B E 469	3
A B E Elective	3 A B E 472	3
AN S/HORT Elective	3 C E 334	3
Animal Production Systems	3 Social Science or Humanities Elective	3
Engineering Elective	3	
Social Science or Humanities Elective		
	<b>17</b>	<b>14</b>

Agricultural Engineering, B.S. - land and water resources engineering option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
CHEM 167	4 MATH 166	4
CHEM 167L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
	<b>16</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
MATH 266	3 M E 324	3
AGRON 181	3 M E 231	3
AGRON 182	3 STAT 305	3
	BIOL 251 or 211	3
	<b>15</b>	<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 316	3 A B E 273	1
A B E 363	4 C E 326	3
A B E 378	3 C E 372	3
E M 327 or A B E 378L	1 MICRO 201	2
GIS Elective	3 MICRO 201L	1



Communication Elective	3 ABE Breadth Elective	3
	US Diversity Elective	3
17		16
Fourth Year		
Fall	Credits Spring	Credits
A B E 415	2 A B E 416	2
A B E 404	3 I E 305	3
A B E 431	3 Subsurface Systems Elective	3
GEOL 201	3 Water Quality Elective	3
Social Science or Humanities Elective	3 Social Science or Humanities Elective	3
International Perspectives Elective	3	
17		14

The Department of Agricultural and Biosystems Engineering has concurrent Bachelor of Science /Master of Science (BS/MS) programs designed especially for departmental seniors who wish to pursue advanced studies. Concurrent BS/MS programs are: agricultural engineering (BS) with agricultural and biosystems engineering (MS) and biological systems engineering (BS) with agricultural and biosystems engineering (MS).

The concurrent BS/MS program allows seniors to:

- Become eligible for a research assistantship during their senior year
- Complete an MS degree (with thesis) within 18 months of BS graduation

For more information about our concurrent undergraduate and graduate programs in Agricultural & Biosystems Engineering, visit: <https://www.abe.iastate.edu/graduate-students/abe-concurrent-degrees/>.

## Graduate Study

The department offers master of science, master of engineering, and doctor of philosophy degrees with a major in agricultural and biosystems engineering. Within the agricultural and biosystems engineering major the student may specialize in advanced machinery engineering, animal production systems engineering, biological and process engineering, occupational safety engineering, or water and environmental stewardship engineering. Details on current research programs available at <http://www.abe.iastate.edu/>. (<http://www.abe.iastate.edu/>)

For the master of science program, at least 30 credits of acceptable graduate work must be completed with a minimum of 22 credits of course work; corresponding numbers for the master of engineering program are 32 and 27. For the doctor of philosophy degree, at least 72 credits of acceptable graduate work must be completed with a

minimum of 42 credits of course work. All Ph.D. students must complete a teaching/extension experience prior to graduation.

The department also offers both master of science and doctor of philosophy degrees in industrial and agricultural technology.

The department also participates in interdepartmental majors in environmental science, sustainable agriculture, human computer interaction, and toxicology (see Index).

## Biological Systems Engineering

For the undergraduate curriculum in biological systems engineering leading to the degree bachelor of science. The Biological Systems Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>.

Biological Systems Engineering integrates life sciences with engineering to solve problems related to, or using, biological systems. These biological systems may include microbes, plants, animals, humans and/or ecosystems. Biological systems engineers have a worldview shaped by an understanding of fundamental principles of engineering and life-sciences. They use their understanding of engineering to analyze organisms or ecosystems, and their knowledge of biological systems to inspire and inform their designs. They approach engineering design from a biological systems perspective, appreciating the complexity of biological systems and developing solutions that accommodate and anticipate the adaptability of biological systems.

**Goal:** To educate students to solve problems related to biorenewables production and processing, water quality, environmental impacts of the bioeconomy, food processing, and biosensors, and in so doing to prepare students for professional practice and post-graduate educational opportunities.

**Student Learning Outcomes:** Graduates of the Biological Systems Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts

5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** Three to five years after graduation, our graduates will be using the knowledge, skills, and abilities from their biological systems engineering degree to improve the human condition through successful careers in a wide variety of fields. They will be effective leaders, collaborators, and innovators who address environmental, social, technical, and business challenges. They will be engaged in life-long learning and professional development through self-study, continuing education, or graduate/professional school.

Well-qualified juniors and seniors in biological systems engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue a bachelor of science degree in biological systems engineering and a master of science degree in agricultural engineering. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses.

A concurrent bachelor of science and master of business administration program is also offered by the department.

The department also offers a bachelor of science curriculum in agricultural engineering. See College of Engineering. Additionally, the department offers bachelor of science curricula in agricultural systems technology and in industrial technology. See College of Agriculture and Life Sciences.

The department also participates in interdepartmental majors in environmental science, sustainable agriculture, human computer interaction, and toxicology (see Index (<http://catalog.iastate.edu/azindex/>)).

## Curriculum in Biological Systems Engineering

Administered by the Department of Agricultural and Biosystems Engineering.

Leading to the degree bachelor of science.

### Total credits required:

**127.0 cr Ecological Engineering Option**

**128.0 cr Food & Bioprocess Engineering Option**

**128.0 cr Open Option.**

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs. International Perspectives: 3 cr.<sup>1</sup>**

**U.S. Diversity: 3 cr.<sup>1</sup>**

### Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
Communication Elective: One of the following (Must have a C or better in this course)		3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
MKT 450	Advanced Professional Selling	
SP CM 212	Fundamentals of Public Speaking	
SP CM 312	Business and Professional Speaking	

### Social Sciences and Humanities: 12 cr.<sup>1,2</sup>

3 credits from international perspectives-university approved list	3
3 credits from U.S. diversity-university approved list	3
6 credits from Social Sciences and Humanities courses-department approved list	6

**Total Credits** **12**

### Basic Program: 24 cr.

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section. Within the Biological Systems Engineering Basic Program, students are required to complete CHEM 167 and CHEM 167L or the sequence of CHEM 177, CHEM 177L, and CHEM 178. This is a departmental requirement within the College of Engineering Basic Program requirements. The CHEM 178 course will show as completing the chemistry portion of the Basic Program and the credits will be applied towards a student's classification.

A B E 160	Systematic Problem Solving and Computer Programming <sup>3</sup>	3
CHEM 167	General Chemistry for Engineering Students or CHEM 177 and CHEM 178	4
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3

ENGR 101	Engineering Orientation	R
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Biological, Math and Physical Science: 23 cr.**

BIOL 212	Principles of Biology II	3
CHEM 167L	Laboratory in General Chemistry for Engineering	1
or CHEM 177L	Laboratory in General Chemistry I	
Chemistry Sequence I (select from list of lecture with corresponding lab)		4
CHEM 231	Elementary Organic Chemistry	
CHEM 231L	Laboratory in Elementary Organic Chemistry	
CHEM 331	Organic Chemistry I	
CHEM 331L	Laboratory in Organic Chemistry I	
MATH 267	Elementary Differential Equations and Laplace Transforms	4
MICRO 302	Biology of Microorganisms	3
MICRO 302L	Microbiology Laboratory	1
STAT 305	Engineering Statistics (Chemistry Sequence I)	3
Chemistry Sequence II (select from list of lecture with corresponding lab)		4
CHEM 211	Quantitative and Environmental Analysis	
CHEM 211L	Quantitative and Environmental Analysis Laboratory	
CHEM 332	Organic Chemistry II	
CHEM 332L	Laboratory in Organic Chemistry II	
FS HN 311	Food Chemistry	
FS HN 311L	Food Chemistry Laboratory	
<b>Total Credits</b>		<b>23</b>

**Biological Systems Engineering Core: 42 cr.**

(A minimum GPA of 2.00 required for this set of courses, including any transfer courses; please note that transfer course grades will not be calculated into the Core GPA).

A B E 216	Fundamentals of Agricultural and Biosystems Engineering	3
A B E 218	Project Management & Design in Agricultural and Biosystems Engineering	2
A B E 273	CAD for Process Facilities and Land Use Planning	1
A B E 316	Applied Numerical Methods for Agricultural and Biosystems Engineering	3

A B E 363	Agri-Industrial Applications of Electric Power and Electronics	4
A B E 378	Mechanics of Fluids	3
A B E 380	Principles of Biological Systems Engineering	3
A B E 404	Instrumentation for Agricultural and Biosystems Engineering	3
A B E 415	Agricultural & Biosystems Engineering Design I	2
A B E 416	Agricultural & Biosystems Engineering Design II	2
A B E 480	Engineering Analysis of Biological Systems	3
C E 274	Engineering Statics	3
E M 324	Mechanics of Materials	3
E M 327	Mechanics of Materials Laboratory	1
or A B E 378L	Mechanics of Fluids Laboratory	
I E 305	Engineering Economic Analysis	3
M E 231	Engineering Thermodynamics I	3
<b>Total Credits</b>		<b>42</b>

**Other Remaining Courses: 11 cr.**

A B E 110	Experiencing Agricultural and Biosystems Engineering	1
A B E 170	Engineering Graphics and Introductory Design	3
A B E 201	Preparing for Workplace Seminar	1
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
Communication Elective: One of the following (Must have a C or better in this course)		3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
MKT 450	Advanced Professional Selling	
SP CM 212	Fundamentals of Public Speaking	
SP CM 312	Business and Professional Speaking	
<b>Total Credits</b>		<b>11</b>

Complete remaining courses from one of the following options:

**Ecological Engineering Option: 15 cr.**

A B E 431	Design and Evaluation of Soil and Water Conservation Systems	3
A B E 434X	Ecosystem Restoration Engineering	3
C E 372	Engineering Hydrology and Hydraulics	3
Ecological Elective <sup>2</sup>		6
<b>Total Credits</b>		<b>15</b>

**Food & Bioprocess Engineering Option: 16 cr.**

A B E 451	Food and Bioprocess Engineering	3
A B E 452X	Emerging Technologies in Biomanufacturing	3
A B E 469	Engineering for Grain Storage, Preservation, Handling, and Processing Systems	3
M E 436	Heat Transfer	4
Food Elective (select 3 cr from the following):		3
A B E 325	Biorenewable Systems	
FS HN 420	Food Microbiology	
FS HN 471	Food Processing	
SCM 301	Supply Chain Management	
<b>Total Credits</b>		<b>16</b>

**Open Option: 16 cr.**

A B E 451	Food and Bioprocess Engineering	3
M E 436	Heat Transfer	4
Sequence I, II & III Elective <sup>2</sup>		9
<b>Total Credits</b>		<b>16</b>

**Co-op/Internships (Optional)**

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program.  
U.S. Diversity, International Perspectives and Social Science/Humanities courses may not be taken Pass/Not Pass.
2. Choose from department approved list. (<http://www.abe.iastate.edu/undergraduate-students/biological-systems-engineering/bse-curricula/>)
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

**TRANSFER CREDIT REQUIREMENTS**

Students graduating with a degree in A E or BSE are required to have a minimum of 18 credits of 300-level and 400-level ABE courses taken at Iowa State University (excluding 490, 415, and 416), and must complete the two-semester ABE Capstone sequence (ABE 415 & 416) at Iowa State University. The Department of Agricultural & Biosystems Engineering requires a grade of C or better for any transfer credit course that is applied to the degree program.

See also: A 4-year plan of study grid showing course template by semester for Biological Systems Engineering.

Biological Systems Engineering, B.S. - ecological engr option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
CHEM 167	4 MATH 166	4
CHEM 167L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
<b>16</b>		<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
BIOL 212	3 A B E 273	1
CHEM 231	3 M E 231	3
CHEM 231L	1 MATH 267	4
US Diversity Elective	3 CHEM 211	2
	CHEM 211L	2
<b>16</b>		<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 316	3 A B E 363	4
A B E 378	3 A B E 380	3
MICRO 302	3 C E 372	3
MICRO 302L	1 E M 324	3
STAT 305	3 I E 305	3
Communication Elective	3	
<b>16</b>		<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 415	2 A B E 416	2
A B E 404	3 A B E 434X	3
A B E 431	3 E M 327 or A B E 378L	1
A B E 480	3 Ecological Elective	3
Social Science or Humanities Elective	3 Ecological Elective	3
International Perspectives Elective	3 Social Science or Humanities Elective	3
<b>17</b>		<b>15</b>

Biological Systems Engineering, B.S. Food & Bioprocess Engineering Option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
MATH 165	4 MATH 166	4
CHEM 167	4 PHYS 231	4
CHEM 167L	1 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
	<b>16</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
BIOL 212	3 A B E 273	1
CHEM 231	3 MATH 267	4
CHEM 231L	1 MICRO 302	3
US Diversity Elective	3 MICRO 302L	1
	M E 231	3
	<b>16</b>	<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 316	3 A B E 363	4
A B E 378	3 A B E 380	3
STAT 305	3 A B E 469	3
FS HN 311	3 E M 324	3
FS HN 311L	1 I E 305	3
Communication Elective	3	
	<b>16</b>	<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 415	2 A B E 416	2
A B E 404	3 A B E 451	3
A B E 480	3 E M 327 or A B E 378L	1
A B E 452X Emerging Technologies in Biomanufacturing	3 M E 436	4
Option Elective	3 Social Science or Humanities Elective	3
International Perspectives Elective	3 Social Science or Humanities Elective	3
	<b>17</b>	<b>16</b>

## Biological Systems Engineering, B.S. - Open Option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGR 101	R A B E 110	1
A B E 170	3 A B E 160	3
CHEM 167	4 MATH 166	4
CHEM 167L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 ENGL 250	3
LIB 160	1	
	<b>16</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 216	3 A B E 218	2
C E 274	3 A B E 201	1
BIOL 212	3 A B E 273	1
CHEM 331	3 CHEM 332	3
CHEM 331L	1 CHEM 332L	1
US Diversity Elective	3 MATH 267	4
	M E 231	3
	<b>16</b>	<b>15</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 316	3 A B E 363	4
A B E 378	3 A B E 380	3
MICRO 302	3 E M 324	3
MICRO 302L	1 I E 305	3
STAT 305	3 Sequence I Elective	3
Communication Elective	3	
	<b>16</b>	<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
A B E 415	2 A B E 416	2
A B E 404	3 A B E 451	3
A B E 480	3 E M 327 or A B E 378L	1
Sequence II Elective	3 M E 436	4
International Perspectives Elective	3 Sequence III Elective	3
Social Science or Humanities Elective	3 Social Science or Humanities Elective	3
	<b>17</b>	<b>16</b>

The Department of Agricultural and Biosystems Engineering has concurrent Bachelor of Science /Master of Science (BS/MS) programs designed especially for departmental seniors who wish to pursue advanced studies. Concurrent BS/MS programs are: agricultural engineering (BS) with agricultural and biosystems engineering (MS) and biological systems engineering (BS) with agricultural and biosystems engineering (MS).

The concurrent BS/MS program allows seniors to:

- Become eligible for a research assistantship during their senior year
- Complete an MS degree (with thesis) within 18 months of BS graduation

For more information about our concurrent undergraduate and graduate programs in Agricultural & Biosystems Engineering, visit: <https://www.abe.iastate.edu/graduate-students/abe-concurrent-degrees/>.

## Graduate Study

The department offers master of science, master of engineering, and doctor of philosophy degrees with a major in agricultural and biosystems engineering. Within the agricultural and biosystems engineering major the student may specialize in advanced machinery engineering, animal production systems engineering, biological and process engineering, occupational safety engineering, or water and environmental stewardship engineering. Details on current research programs available at <http://www.abe.iastate.edu/>.

For the master of science program, at least 30 credits of acceptable graduate work must be completed with a minimum of 22 credits of course work; corresponding numbers for the master of engineering program are 32 and 27. For the doctor of philosophy degree, at least 72 credits of acceptable graduate work must be completed with a minimum of 42 credits of course work. All Ph.D. students must complete a teaching/extension experience prior to graduation.

The department also offers both master of science and doctor of philosophy degrees in industrial and agricultural technology.

## Biomedical Engineering Minor Undergraduate Study

Minor supervised by an interdisciplinary faculty committee, administered by the Chemical and Biological Engineering Department. The Biomedical Engineering minor is a unique opportunity for engineering students to acquire a multi-disciplinary engineering and life sciences background for entering the field of biomedical engineering.

The program is open to all undergraduate engineering students at Iowa State University. This minor will provide students with a foundation of core biology and engineering relevant to further study in biomedical

engineering along with an introduction to the application of engineering principles to biomedical problems from a multidisciplinary perspective as well as the applications within the majors of the participating departments.

A minimum of 17 cr. meeting the six requirements below with a minimum of 9 of those credits not being used to meet degree requirements and a minimum of 6 cr. at the 300 level or above. No more than 3 cr. of 490 credit may be applied to this minor.

BIOL 212	Principles of Biology II	3
B M E/CH E 220	Introduction to Biomedical Engineering	3
BIOL 256	Fundamentals of Human Physiology	3
or BIOL 335	Principles of Human and Other Animal Physiology	
Introductory Engineering Elective *		3
Advanced Engineering Elective **		3
Professional Elective ***		2-3
<b>Total Credits</b>		<b>17-18</b>

\*A second (Introductory) engineering course from a department other than that of your major. The topic of the course should have ready application to later B M E-related electives in that discipline (C E 274; CH E 210; CPR E 281; E E 201, E E 314, or E E 442 and E E 448; E M 324 or A B E 378; I E 271; MAT E 273; M E 231; or other courses approved by Minor Chair).

\*\* 300-500 level engineering course with clear biomedical engineering application (B M E 490, E E 341, E E 450; CH E 440; MAT E 456; I E 447; I E 571; M E 550 or other courses approved by Minor Chair).

\*\*\* 300-500 level engineering or life sciences course with clear biomedical engineering application OR B M E 490 OR departmental 490 with biomedical engineering topic OR 200+-level life sciences laboratory course (If a 200-level course is chosen here, the student will need to meet the required 6 cr. of 300+ courses by substitution of a higher-level course for the other requirements or by taking an additional course.), OR 300-500 level B M E course.

## Chemical Engineering

<http://www.cbe.iastate.edu/>

### Administered by the Department of Chemical and Biological Engineering

For undergraduate curriculum in chemical engineering leading to the degree bachelor of science. The Chemical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Chemical engineering is a profession, which provides a link between scientific knowledge and manufactured products. The chemical engineer



relies on science, experience, creativity, and ingenuity to produce these materials economically. Almost everything of a material nature used by society today has at some point felt the influence of the chemical engineer. From raw materials such as minerals, coal, petroleum, and agricultural products; chemical engineers create versatile intermediate and commodity chemicals, high performance fuels, new materials for construction, pharmaceuticals, high performance foodstuffs, synthetic textiles, plastics, solid state electronic components, and dozens of other engineered materials. The chemical engineer's influence has been important in the development of catalysts, fuel cells, automatic controls, biochemical processes, artificial kidneys, tissue engineering, nuclear energy, medical instruments and devices, as well as in the development of air and water pollution control systems. Many new and equally exciting challenges await the practicing chemical engineer of the future.

The profession of chemical engineering embraces a wide variety of activities including research, process development, product development, design, manufacturing supervision, technical sales, consulting, and teaching. The engineer can be behind a desk, in a laboratory, in a manufacturing plant, or engaged in nationwide and worldwide travel. Successful chemical engineers find chemistry, mathematics, and physics to be interesting and exciting. Many chemical engineers also have interest in the biological sciences. The curriculum in chemical engineering includes continued study of chemistry, biochemistry, mathematics, and physics as well as intensive study in the engineering sciences such as chemical reaction engineering, thermodynamics, mass transfer, fluid mechanics, heat transfer, system analysis and process synthesis, and design.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. communicate effectively with a range of audiences
4. recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. acquire and apply new knowledge as needed, using appropriate learning strategies

The curriculum assures that graduates have a thorough grounding in chemistry, along with a working knowledge of advanced chemistry such as organic, inorganic, physical, analytical, materials chemistry, or biochemistry. In addition, a working knowledge, including safety and environmental aspects, of material and energy balances applied to chemical processes; thermodynamics of physical and chemical equilibria; heat, mass, and momentum transfer; chemical reaction engineering; continuous and stage-wise separation operations; process dynamics and control; process design; and appropriate modern experimental and computing techniques is assured.

## Program Educational Objectives

The objectives of the Chemical Engineering Program at Iowa State University are to produce graduates who:

- will excel in careers as professional chemical engineers in the businesses and industries related to chemical engineering; and
- will successfully pursue research and advanced studies in chemical engineering, or in related fields such as chemistry or biology, or in related professional fields such as medicine, law, and business.

## Cooperative Education

A cooperative education program is available to students in chemical engineering.

## Curriculum in Chemical Engineering

Degree requirements leading to the degree bachelor of science.

**Total credits required: 128.0.**

**INTERNATIONAL PERSPECTIVES <sup>1</sup>: 3 CR.**

**U.S. DIVERSITY <sup>1</sup>: 3 CR.**

**COMMUNICATION PROFICIENCY/LIBRARY REQUIREMENT:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
One of the following (C or better in this course)		3
ENGL 309	Proposal and Report Writing	
ENGL 312	Communicating Science and Public Engagement	
ENGL 314	Technical Communication	
JL MC 347	Science Communication	

**The CBE Department requires a grade of a C or better for any transfer credit course that is applied to the degree program but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA.**

**Social Sciences and Humanities: 15 cr.**<sup>2</sup>

Complete a total of 15 cr. with at least 6 cr. but not more than 9 cr. from the same department.

**Basic Program: 24 cr.**<sup>3</sup>

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Basic Program for Engineering Curricula in College of Engineering section.

CHEM 177	General Chemistry I	4
or CHEM 167	General Chemistry for Engineering Students	
or CHEM 201	Advanced General Chemistry	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
CH E 160	Chemical Engineering Problems with Computer Applications Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Math and Physical Science: 30 cr.**

MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
CHEM 177L	Laboratory in General Chemistry I <sup>4</sup>	1
or CHEM 167L	Laboratory in General Chemistry for Engineering	
or CHEM 201L	Laboratory in Advanced General Chemistry	
CHEM 178	General Chemistry II <sup>4</sup>	3
CHEM 178L	Laboratory in College Chemistry II <sup>4</sup>	1
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1
BBMB 303	General Biochemistry	3
<b>Total Credits</b>		<b>30</b>

**Chemical Engineering Core: 38 cr.**

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Core Program GPA).

CH E 202	Chemical Engineering Seminar	R
CH E 205	Chemical Engineering Progress Assessment	R
CH E 210	Material and Energy Balances	3
CH E 310	Computational Methods in Chemical Engineering	3
CH E 325	Chemical Engineering Laboratory I	2
CH E 356	Transport Phenomena I	3
CH E 357	Transport Phenomena II	3
CH E 358	Separations	3
CH E 381	Chemical Engineering Thermodynamics	3
CH E 382	Chemical Reaction Engineering	3
CH E 420	Chemical Process Safety	3
CH E 421	Process Control	3
CH E 426	Chemical Engineering Laboratory II	2
CH E 429	Chemical Engineering Product Design	3
CH E 430	Process and Plant Design	4
<b>Total Credits</b>		<b>38</b>

**Other Remaining Courses: 21 cr.**<sup>2</sup>

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
One of the following Communication Electives:		3
ENGL 309	Proposal and Report Writing (Must have a C or better in this course)	
ENGL 312	Communicating Science and Public Engagement (Must have a C or better in this course)	
ENGL 314	Technical Communication (Must have a C or better in this course)	
JL MC 347	Science Communication (Must have a C or better in this course)	
Statistics Electives <sup>2</sup>		3
Chemical Engineering Electives <sup>2</sup>		6
Engineering Electives <sup>2</sup>		3
Professional Electives <sup>2</sup>		3
<b>Total Credits</b>		<b>21</b>

**SEMINARS/CO-OPS/INTERNSHIPS:**

Co-op/Internship is optional

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list (<http://www.cbe.iastate.edu/current-students/guides-and-handbooks/>).

- 3. See Basic Program for Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
- 4. Students who substitute CHEM 201/201L credit for CHEM 177/CHEM 177L/CHEM 178L credit cannot also receive credit for CHEM 178. Credit for CHEM 178 must be earned through an Advanced Chemistry Elective<sup>2</sup>.

Note: Transfer students with transfer credits in chemical engineering core courses must earn at least 15 semester credits in ISU courses in this category at the 300-level or above to qualify for the B.S. degree in chemical engineering.

Pass-Not Pass Policy

A maximum of nine Pass-Not Pass semester credits may be used to meet graduation requirements. Courses offered on a Satisfactory-Fail basis may not be taken on a Pass-Not Pass basis. Pass-Not Pass credits can be applied toward requirements for a B.S. degree in chemical engineering only if the course is specified in the curriculum as a social science and humanities elective or is a course not used in the degree program. Pass-Not Pass credits are not acceptable for technical elective courses or for courses used to satisfy the US diversity or international perspectives requirements.

See also: A 4-year plan of study grid showing course template by semester.

Chemical Engineering, B.S.

Freshman

Fall	Credits Spring	Credits
CH E 160	3 CHEM 178	3
ENGR 101	R CHEM 178L	1
CHEM 177	4 MATH 166	4
CHEM 177L	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
ENGL 150	3 SSH Elective*	3
LIB 160	1	
	16	16

Sophomore

Fall	Credits Spring	Credits
CH E 202	R CH E 356	3
CH E 205	R CHEM 325	3
CH E 210	3 CHEM 332	3
CHEM 331	3 MATH 267	4
MATH 265	4 ENGL 250	3
PHYS 232	4	

PHYS 232L	1	
	15	16
Junior		
Fall	Credits Spring	Credits
CH E 310	3 CH E 325	2
CH E 357	3 CH E 358	3
CH E 381	3 CH E 382	3
BBMB 303	3 Engineering Elective*	3
Statistics Elective*	3 Communication Elective*	3
	SSH Elective*	3
	15	17
Senior		
Fall	Credits Spring	Credits
CH E 420	3 CH E 426	2
CH E 421	3 CH E 430	4
CH E 429	3 CH E Elective*	3
CH E Elective*	3 Professional Elective*	3
SSH Elective*	3 SSH Elective*	3
	SSH Elective*	3
	15	18

\* Choose from department approved list (<http://www.cbe.iastate.edu/current-students/guides-and-handbooks/>).

The Chemical and Biological Engineering Department offers well-qualified juniors and seniors in chemical engineering who are interested in graduate study the opportunity to apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science in Chemical Engineering and the Master of Engineering in Chemical Engineering.

For more information about concurrent undergraduate and graduate programs in Chemical Engineering visit: <https://www.cbe.iastate.edu/prospective-students/bachelorsmasters-concurrent-degree-programs> (<https://www.cbe.iastate.edu/prospective-students/bachelorsmasters-concurrent-degree-programs/>).

Graduate Study

The department offers work for the degrees master of science, master of engineering, and doctor of philosophy with major in chemical engineering, and minor work to students taking major work in other departments. Prerequisite to major graduate work is a bachelor's degree in chemical engineering, chemistry, or other related field. Students with undergraduate background other than chemical engineering should contact the department for further details. A thesis is required for the

master of science degree. The master of science degree also requires a minimum of 30 graduate credits (minimum of 15 for coursework, 12 within Ch E and 3 outside). The master of engineering requirements are the same for total credits but include a special project or coursework rather than research thesis. The doctor of philosophy degree requires a minimum of 72 graduate credits (minimum of 26 for coursework, at least 16 inside Ch E). Candidates for the doctor of philosophy degree can refer to the department's home page and/or the department's Graduate Student Handbook for degree options and credit requirements.

## Civil Engineering

<http://www.ccee.iastate.edu/>

### Administered by the Department of Civil, Construction and Environmental Engineering

For undergraduate curriculum in civil engineering leading to the degree bachelor of science. The Civil Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Civil engineers apply principles of motion and materials to plan, design, construct, maintain, and operate public and private facilities, while working under economic, social, and environmental constraints. Commonly included are transportation systems; bridges and buildings; water supply, pollution control, waste management, irrigation, and drainage systems; river and harbor improvements; dams and reservoirs. Civil engineering also includes planning, designing, and executing surveying operations and locating, delimiting, and delineating physical and cultural features on the earth's surface. Research, testing, sales, management, and related functions are also a part of civil engineering. Work on campus is supplemented by inspection trips, which furnish an opportunity for firsthand study of engineering systems in operation, as well as projects under construction.

Environmental engineering, as an emphasis in civil engineering, is concerned with protecting the public and natural health; providing an ample safe water supply; managing solid and hazardous waste; treating and disposing of domestic and industrial wastewaters and waste; resource recovery; providing adequate drainage of urban and rural areas for sanitation; and controlling water quality, soil contamination, and air pollution. The environmental emphasis for the civil engineering degree replaces some of the courses and electives in the general curriculum with further courses in chemistry, biology, and microbiology as well as specific topics in environmental engineering and design.

### Student Learning Outcomes

Graduates of the civil engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### Program Educational Objectives

By three to five years after graduation, graduates of the civil engineering program will have:

1. Pursued successful careers and expertise in civil engineering or a related profession.
2. Collaborated effectively on multi-disciplinary teams to address the needs of society and the environment.
3. Pursued lifelong learning, professional development, and licensure as appropriate for their career goals.

The civil engineering curriculum equips students with a broad education that includes technical skills in analysis and design and professional practices such as communication, teamwork, leadership, and ethics.

The faculty encourages the students to develop their professional skills by participating in cooperative education, internships, or progressive summer engineering employment and study abroad programs. Qualified juniors and seniors interested in graduate studies may apply to the Graduate College to concurrently pursue the bachelor degree and either a master of science in Civil Engineering or a master of business administration in the College of Business Administration. These students would have the opportunity to graduate in five years with both degrees.

## Curriculum in Civil Engineering (General)

Administered by the Department of Civil, Construction and Environmental Engineering.

Leading to the degree bachelor of science.

### Total credits required: 129.

Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.

#### International Perspectives: 3 cr. <sup>1</sup>

#### U.S. Diversity: 3 cr. <sup>1</sup>

#### Communication Proficiency/Library requirement

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1

#### Social Sciences and Humanities: 12 cr. <sup>2</sup>

Complete 12 cr. with 6 cr. at 200-level or above.

#### Basic Program: 24 cr. <sup>3</sup>

A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177 & CHEM 178	General Chemistry I and General Chemistry II	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
C E 160	Engineering Problems with Computational Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

#### Math and Physical Science: 18 cr.

CHEM 167L	Laboratory in General Chemistry for Engineering	1
or CHEM 177L	Laboratory in General Chemistry I	
CHEM 178 & 178L	General Chemistry II and Laboratory in College Chemistry II <sup>4</sup>	4-5
or PHYS 232 & 232L	Introduction to Classical Physics II and Introduction to Classical Physics II Laboratory	

GEOL 201	Geology for Engineers and Environmental Scientists	3
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MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
Statistics Elective <sup>2</sup>		3

**Total Credits** **18-19**

#### Civil Engineering Core: 31 cr. Minimum GPA of 2.00 required for this set of courses to graduate (including transfer courses; please note that transfer course grades will not be calculated into the Core GPA).

C E 274	Engineering Statics	3
E M 324	Mechanics of Materials	3
M E 345	Engineering Dynamics	3
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	3
C E 326	Principles of Environmental Engineering	3
A B E 378	Mechanics of Fluids	3
C E 332	Structural Analysis I	3
C E 355	Principles of Transportation Engineering	3
C E 360	Geotechnical Engineering	4
C E 372	Engineering Hydrology and Hydraulics	3

**Total Credits** **31**

#### Other Remaining Courses: 44 cr.

C E 120	Civil Engineering Learning Community	1
C E 111	Geomatics	3
C E 170	Graphics for Civil Engineering	2
C E 306	Project Management for Civil Engineers	3

Any two of the following three courses: 6

C E 333	Structural Steel Design I	
C E 334	Reinforced Concrete Design I	
C E 460	Foundation Engineering	

C E 382	Design of Concretes	3
C E 485	Civil Engineering Design	3
E M 327	Mechanics of Materials Laboratory	1

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
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SP CM 212	Fundamentals of Public Speaking	3
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Civil Engineering Design Elective <sup>2</sup>		3
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Technical Communication Elective <sup>2</sup>		3
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Engineering Topics Electives <sup>2</sup>		10
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**Total Credits** **44**

**Seminar/Co-op/Internships: R cr.**

C E 403 Program and Outcome Assessment

R

**Notes.**

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list (<http://www.ccee.iastate.edu/academics/advising/civil-engineering-student-forms/>). At least six of eleven credits must be C E or Con E courses for the Engineering Topics Electives.
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
4. Students who transfer in with CHEM 167/CHEM 167L will be able to take CHEM 178/CHEM 178L to complete the program's Chemistry requirement.

See also: A 4-year plan of study grid showing course template by semester for Civil Engineering

## Curriculum in Civil Engineering with Environmental Option

Administered by the Department of Civil, Construction and Environmental Engineering.

Leading to the degree bachelor of science.

**Total credits required: 132.**

Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.

**International Perspectives: 3 cr. <sup>1</sup>****U.S. Diversity: 3 cr. <sup>1</sup>****Communication Proficiency/Library requirement:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1

**Social Sciences and Humanities: 12 cr. <sup>2</sup>**

Complete 12 cr. with 6 cr. at 200-level or above.

**Basic Program: 24 cr. <sup>3</sup>. Minimum GPA of 2.00 required for this set of courses to graduate, including any transfer courses (please note that transfer course grades will not be calculated into the Basic Program GPA).**

CHEM 177	General Chemistry I	4
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
C E 160	Engineering Problems with Computational Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Math and Physical Science: 27 cr.**

CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II <sup>4</sup>	3
CHEM 178L	Laboratory in College Chemistry II <sup>4</sup>	1
CHEM 231	Elementary Organic Chemistry	3
BIOL 251	Biological Processes in the Environment	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
GEOL 201	Geology for Engineers and Environmental Scientists	3
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
MICRO 201	Introduction to Microbiology	2
Statistics Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>27</b>

**Civil/Env Engineering Core: 28 cr. Minimum GPA of 2.00 required for this set of courses to graduate (including transfer courses; please note that transfer course grades will not be calculated into the Core GPA).**

C E 274	Engineering Statics	3
E M 324	Mechanics of Materials	3
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	3
C E 326	Principles of Environmental Engineering	3
C E 332	Structural Analysis I	3
A B E 378	Mechanics of Fluids	3
C E 355	Principles of Transportation Engineering	3
C E 360	Geotechnical Engineering	4



C E 372	Engineering Hydrology and Hydraulics	3
<b>Total Credits</b>		<b>28</b>

**Other Remaining Courses: 41 cr.**

C E 120	Civil Engineering Learning Community	1
C E 111	Geomatics	3
C E 170	Graphics for Civil Engineering	2
C E 306	Project Management for Civil Engineers	3
C E 334	Reinforced Concrete Design I	3
C E 382	Design of Concretes	3
C E 428	Water and Wastewater Treatment Plant Design	3
Any two of the following four courses		6
ENV E 426	Environmental Engineering Science	
ENV E 427	Environmental Engineering Systems	
ENV E 429	Air Pollution and Control	
ENV E 430	Solid and Hazardous Waste Management	
C E 485	Civil Engineering Design	3
E M 327	Mechanics of Materials Laboratory	1
A B E 378L	Mechanics of Fluids Laboratory	1
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
SP CM 212	Fundamentals of Public Speaking	3
Civil Engineering Design Elective <sup>2</sup>		3
Technical Communication Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>41</b>

**Seminar/Co-op/Internships: R cr.**

C E 403	Program and Outcome Assessment	R
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**Co-op/Internship optional.****Notes.**

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list. (<http://www.ccee.iastate.edu/academics/advising/civil-engineering-student-forms/>) At least six of eleven credits must be C E or Con E courses for the Engineering Topics Electives.
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
4. Students who transfer in with CHEM 167 General Chemistry for Engineering Students/CHEM 167L Laboratory in General Chemistry for Engineering will be able to take CHEM 178 General Chemistry

II/CHEM 178L Laboratory in College Chemistry II to complete the program's Chemistry requirement.

See also: A 4-year plan of study grid showing course template by semester for Civil Engineering

**Civil Engineering, B.S. - environmental OPTION****First Year**

Fall	Credits Spring	Credits
C E 160	3 C E 170	2
CHEM 177	4 MATH 166	4
CHEM 177L	1 PHYS 231	4
ENGL 150	3 PHYS 231L	1
MATH 165	4 SSH Elective	3
ENGR 101	R BIOL 251 (Spring only)	3
C E 120	1	
<b>16</b>		<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
ENGL 250	3 C E 111	3
C E 274	3 C E 206	3
CHEM 178	3 C E 306	3
CHEM 178L	1 E M 324	3
MATH 265	4 MATH 266	3
GEOL 201	3 Statistics Elective	3
LIB 160	1	
<b>18</b>		<b>18</b>

**Third Year**

Fall	Credits Spring	Credits
C E 332	3 C E 326	3
C E 355	3 C E 334	3
C E 382	3 SP CM 212	3
A B E 378	3 C E 372	3
A B E 378L	1 Technical Communication Elective	3
E M 327	1 MICRO 201	2
CHEM 231	3	
CHEM 231L	1	
<b>18</b>		<b>17</b>

**Fourth Year**

Fall	Credits Spring	Credits
C E 360	4 C E 403	R
SSH Elective	6 Take two of four: ENV E 426, 427, 429 or 430	3

C E Design Elective	3	ENV E 427 (Spring only)	
Take two of four: ENV E 426, 427, 429 or 430	3	ENV E 429 (Spring only)	
ENV E 426 (Fall only)	C E 428	3	
ENV E 430 (Fall only)	C E 485	3	
	SSH Electives	3	
<b>16</b>		<b>12</b>	

## Civil Engineering, B.S. - GENERAL Program

**First Year**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
C E 160	3	C E 170	2
CHEM 177	4	MATH 166	4
CHEM 177L	1	SP CM 212	3
ENGL 150	3	PHYS 231	4
MATH 165	4	PHYS 231L	1
ENGR 101	R		
C E 120	1		
<b>16</b>		<b>14</b>	

**Second Year**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
ENGL 250	3	E M 324	3
CHEM 178	3	MATH 266	3
CHEM 178L	1	C E 306	3
C E 274	3	Statistics Elective	3
MATH 265	4	A B E 378	3
GEOL 201	3	C E 111	3
LIB 160	1		
<b>18</b>		<b>18</b>	

**Third Year**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
C E 332	3	C E 334 (CE 460 may be substituted for CE 333 or CE 334)	3
M E 345	3	C E 372	3
C E 360	4	C E 382	3
E M 327	1	Engr Topic Elective	2
Technical Communication	3	SSH Elective	3
C E 206	3	C E 355	3
<b>17</b>		<b>17</b>	

**Fourth Year**

<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
C E 333 (CE 460 may be substituted for CE 333 or CE 334)	3	C E 403	R
Engr Topic Elective	5	C E 485	3
SSH Elective	6	CE Design Elective	3
C E 326	3	Engr Topic Elective	3
		SSH Elective	3
<b>17</b>		<b>12</b>	

A concurrent bachelor of science/master of science (B.S./M.S.) degree program is available to qualified seniors at Iowa State University.

Go to: <https://www.ccee.iastate.edu/prospective-graduate-students/concurrent-programs/> for more information.

## Graduate Study

The Department of Civil, Construction and Environmental Engineering offers graduate programs for the degrees of master of engineering, master of science, and doctor of philosophy with a major in civil engineering with areas of specialization in structural engineering, environmental engineering, construction engineering and management, geotechnical engineering, civil engineering materials, transportation engineering, and intelligent infrastructure engineering. The department also offers graduate minors of 9 to 15 credits of coursework to students from other engineering departments.

Candidates for the degrees of master of engineering and master of science are required to complete a total of 30 acceptable graduate credits. The master of engineering degree involves all course work. The master of science degree requires the preparation of a thesis or creative component.

Candidates for the doctor of philosophy degree are required to complete a minimum of 72 acceptable graduate credits. Normal prerequisite for major graduate work in civil engineering is the completion of an undergraduate curriculum substantially equivalent to that required of engineering students at this university. Due to the diversity of interests within the graduate programs in civil engineering, a student may qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering. Supporting work will be required depending upon the student's background and area of interest. The department participates in the interdepartmental graduate programs in transportation, environmental science, and wind energy science, engineering and policy.

The department also offers graduate certificates in construction management, environmental engineering, and environmental systems.

The construction management certificate requires 12 graduate credits (nine credits of “core courses” and three credits of approved “elective courses”).

The environmental engineering or environmental systems certificate requires 12 graduate credits (six credits of “core courses”, six credits of approved “elective courses”) and a seminar course or an approved equivalent.

Additional information about graduate programs, research and admission criteria are available on the department’s website <http://www.ccee.iastate.edu/academics/graduate/>.

## Computer Engineering

[www.ece.iastate.edu](http://www.ece.iastate.edu) (<http://www.ece.iastate.edu>)

### Administered by the Department of Electrical and Computer Engineering

For the undergraduate curriculum in computer engineering leading to the degree Bachelor of Science. The Computer Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The Department of Electrical and Computer Engineering (ECpE) at Iowa State University provides undergraduate students with the opportunity to learn electrical and computer engineering fundamentals, study applications of the most recent advances in state-of-the-art technologies, and to prepare for the practice of computer engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

The computer engineering curriculum offers focus areas in software systems, embedded systems, networking, information security, computer architecture, and VLSI.

Students also may take elective courses in control systems, electromagnetics, microelectronics, VLSI, power systems, and communications and signal processing.

**Student Learning Outcomes:** Graduates of the Computer Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** The program objectives for the computer engineering programs describe accomplishments that graduates are expected to attain within five years after graduation. Graduates will have applied their expertise to contemporary problem solving, be engaged professionally, have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives for expertise, engagement, learning, leadership and teamwork are defined below for each program.

The objectives of the computer engineering program at Iowa State University are:

- Graduates, within five years of graduation, should demonstrate peer-recognized **expertise** together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and evaluation of computer and software systems, including system integration and implementation.
- Graduates, within five years of graduation, should demonstrate **engagement** in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.
- Graduates, within five years of graduation, should demonstrate sustained **learning** and adapting to a constantly changing field through graduate work, professional development, and self study.
- Graduates, within five years of graduation, should demonstrate **leadership** and initiative to ethically advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.
- Graduates, within five years of graduation, should demonstrate a commitment to **teamwork** while working with others of diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the ECpE department provides opportunities for each student to have experience with broadening activities. Through the cooperative education and internship

program, students have the opportunity to gain practical industry experience. Students have the opportunity to participate in advanced research activities, and through international exchange programs, students learn about engineering practices in other parts of the world. Well-qualified juniors and seniors in computer engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees.

## Curriculum in Computer Engineering

Administered by the Department of Electrical and Computer Engineering.

Leading to the degree Bachelor of Science.

### Total credits required: 127

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.**

**Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

**Communication Proficiency/Library requirement:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Proposal and Report Writing (C or better in this course)	

### General Education Electives: 21 cr.

<sup>2</sup>

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course.)	3
ENGL 314	Technical Communication (Must have a C or better in this course.)	3
or ENGL 309	Proposal and Report Writing	
Complete minimum of 3 cr. from Approved General Education Component 300 level or higher.		3
Complete additional 12 cr. from Approved General Education Component.		12
<b>Total Credits</b>		<b>21</b>

### Basic Program: 24 cr.

**A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.**

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
CPR E 185	Introduction to Computer Engineering and Problem Solving I <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 17 cr.

COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
MATH 207	Matrices and Linear Algebra	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4
STAT 330	Probability and Statistics for Computer Science	3
<b>Total Credits</b>		<b>17</b>

### Computer Engineering Core: 36 cr.

**(A minimum GPA of 2.00 required for this set of courses, including any transfer courses; please note that transfer course grades will not be calculated into the Core GPA).**

CPR E 232	Professional and Ethical Issues in Electrical and Computer Engineering	3
CPR E 281	Digital Logic	4
CPR E 288	Embedded Systems I: Introduction	4
CPR E 308	Operating Systems: Principles and Practice	4
CPR E 310	Theoretical Foundations of Computer Engineering	3
CPR E 381	Computer Organization and Assembly Level Programming	4
COM S 309	Software Development Practices	3
COM S 311	Introduction to the Design and Analysis of Algorithms	3
E E 201	Electric Circuits	4
E E 230	Electronic Circuits and Systems	4
<b>Total Credits</b>		<b>36</b>

**Other Remaining Courses: 29 cr.**

CPR E 491	Senior Design Project I and Professionalism	3
CPR E 492	Senior Design Project II	2
Computational Thinking Technical Electives <sup>2</sup>		6
Computer Engineering Technical Electives <sup>2</sup>		9
Technical Electives <sup>2</sup>		9
<b>Total Credits</b>		<b>29</b>

**Seminar/Co-op/Internships:**

CPR E 166	Professional Programs Orientation	R
CPR E 494	Portfolio Assessment	R

**Co-op or internship is optional.**

Outcomes Assessment - Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses.

**Transfer Credit Requirements**

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a B.S. in computer engineering. These 30 credits must include CPR E 491 Senior Design Project I and Professionalism, CPR E 492 Senior Design Project II, and credits in the core professional curriculum and/or in technical electives. The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass, but are used to meet the general education electives.
2. From department approved lists. (<http://www.ece.iastate.edu/academics/bachelors-degree-requirements/>)
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also: A 4-year plan of study grid showing course template by semester.

Note: International perspectives and U.S. diversity courses are used to meet the general education electives.

Computer Engineering, B.S.

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CHEM 167	4 COM S 227	4
CPR E 185	3 CPR E 166	R
ENGL 150	3 MATH 166	4
ENGR 101	R ENGL 250	3
LIB 160	1 PHYS 231	4
MATH 165	4 PHYS 231L	1
	<b>15</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CPR E 281	4 CPR E 288	4
COM S 228	3 E E 230	4
E E 201	4 CPR E 310	3
MATH 267	4 MATH 207	3
	Gen Ed Elective	3
	<b>15</b>	<b>17</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CPR E 232	3 CPR E 308	4
CPR E 381	4 ENGL 314	3
COM S 311	3 COM S 309	3
General Education Elective	3 CPR E 494	0
Technical Electives	3 General Education Elective	3
	Computational Thinking	3
	Tech Elective	
	<b>16</b>	<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CPR E 491	3 CPR E 492	2
STAT 330	3 Computational Thinking	3
	Tech Elective	
Technical Electives	3 General Education Elective	3
CPR E Elective	6 CPR E Electives	6
General Education Elective	3 Tech Elective	3
	<b>18</b>	<b>17</b>

Computer Engineering students have the opportunity to become a concurrent undergraduate/graduate student in a few programs.

## Concurrent B.S./M.ENG or M.S. in Computer Engineering

## Concurrent B.S./M.ENG or M.S. in Cyber Security

Computer engineering students have the opportunity to begin their coursework towards their masters degree in computer engineering or cyber security during their final semester(s) of undergraduate coursework. In order to be eligible, student must have a 3.0 cumulative GPA or higher to begin a Masters of Engineering ("M.ENG") degree or a 3.3 cumulative GPA to begin a Masters of Science ("M.S.") degree. Students should meet with their academic advisor to discuss this option.

## Concurrent B.S./MBA

Juniors and Seniors have the opportunity to continue their undergraduate coursework while also pursuing a Master of Business Administration (MBA) degree. For additional information please visit the concurrent MBA website [www.ivybusiness.iastate.edu/full-time-concurrent-mba](http://www.ivybusiness.iastate.edu/full-time-concurrent-mba) (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

## Graduate Study

The department offers work for the degrees Master of Engineering, Master of Science, and Doctor of Philosophy with a major in computer engineering and minor work to students with other majors. Minor work for computer engineering majors is usually selected from a wide range of courses outside computer engineering.

The Master of Engineering degree is course-work only. It is recommended for off-campus students.

The Master of Science degree with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component.

The department also offers three graduate certificate programs in embedded systems, computer networking, and software systems.

The normal prerequisite to graduate major work in computer engineering is the completion of undergraduate work substantially equivalent to that required of computer engineering students at this university. It is possible for a student to qualify for graduate study in computer engineering even though the student's undergraduate or prior graduate training has been in a discipline other than computer engineering. Supporting work, if required, will depend on the student's background and area of research interest. Prospective students from a discipline other than computer engineering are required to submit, with the application for admission, a statement of the proposed area of graduate study.

The department requires submission of GRE General test scores by applicants. All students whose first language is not English and who have no U.S. degree must submit TOEFL examination scores. Students pursuing the Doctor of Philosophy must complete the department qualifying process.

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental Master of Science and Doctor of Philosophy degree programs in bioinformatics and computational biology. Students interested in these programs may earn their degrees while working under an advisor in electrical and computer engineering.

The Department of Electrical and Computer Engineering also is a participating department in the interdepartmental certificate, Master of Engineering, and Master of Science in Cyber Security programs. Students interested in studying information assurance topics may earn a degree in computer engineering or in information assurance. (See catalog section on Cyber Security.)

Well-qualified juniors and seniors in computer engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both Bachelor of Science and Master of Science, or Bachelor of Science and Master of Business Administration, or Bachelor of Science and Master of Engineering degrees. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Student Services Office and on the department's web site.

## Construction Engineering

**Administered by the Department of Civil, Construction and Environmental Engineering**

The curriculum in construction engineering, leading to a bachelor of science degree can be referenced here: [www.catalog.iastate.edu/collegeofengineering/constructionengineering/#curriculumtext](http://www.catalog.iastate.edu/collegeofengineering/constructionengineering/#curriculumtext). The Construction Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

## Student Learning Outcomes

Graduates of the construction engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors



3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** Three to five years after graduation, our graduates will have pursued successful careers and expertise in construction engineering or a related profession. They will collaborate effectively on multi-disciplinary teams to address the needs of society and the environment. They will pursue lifelong learning, professional development, and licensure as appropriate for their career goals.

Students who successfully complete the curriculum will be prepared for entry into the field or for further study at the graduate level in construction engineering or related fields of study, such as law, business, and/or other engineering disciplines.

Construction engineers need to possess a strong fundamental knowledge of engineering design and management principles, including knowledge of business procedures, economics, and human behavior. Graduates of this curriculum may expect to engage in design of temporary structures, coordination of project design, systems design, cost estimating, planning and scheduling, company and project management, materials procurement, equipment selection, and cost control. With the emergence of integrated project delivery methods such as design-build construction, the role of the construction engineer is expanding the need for trained professionals that understand both aspects of the project delivery environment. The curriculum offers opportunities to study emphases concerned with building, heavy, mechanical, or electrical construction. The process of construction involves the organization, administration, and coordination of labor resource requirements, temporary and permanent materials, equipment, supplies and utilities, money, technology and methods. These must be integrated in the most efficient manner possible to complete construction projects on schedule, within the budget, and according to the standards of quality and performance specified by the project owner or designer. The curriculum blends engineering, management and business sciences into a study of the processes of construction whereby designer's plans and specifications are converted into physical structures and facilities.

The curriculum develops the ability of students to be team workers, creative thinkers, and effective communicators. This is achieved by encouraging students to:

- interact with practicing professionals
- gain work experience during summer jobs, internship, and cooperative education assignments that emphasize the knowledge required of construction engineers
- develop leadership skills by participating in student organizations
- develop, analyze, and interpret alternative solutions to open-ended problems
- study abroad

The construction industry is becoming increasingly global. Courses in humanities, social sciences, U.S. diversity, and international perspectives are included in the curriculum to broaden the student's perspective of the work environment. In addition, the department has several exchange program opportunities for students to participate in study abroad programs.

Qualified construction engineering students within 30 credits of completing their degree may apply for concurrent enrollment in the Graduate College. See Civil Engineering (<http://www.ccee.iastate.edu/academics/graduate/>) Graduate Study for more information.

## Curriculum in Construction Engineering

Administered by the Department of Civil, Construction and Environmental Engineering; leading to the degree bachelor of science.

Construction Engineering students will initially be considered construction undecided option when starting the degree and are encouraged to choose an option in Construction Engineering before their 5th semester. If not, option courses taken by the student will not be applied until the student chooses an option. Students must pick an option prior to graduation. The four options in the program are building, electrical, infrastructure, and mechanical. The Core courses for each option are the same whereas the option selections of the degree audit will be comprised of different classes that explore the particular focus the students has chosen.

**Total credits required: Building Option -128.0, Electrical Option - 127.0, Infrastructure Option - 127.0, Mechanical Option - 127.0 cr.**

The Construction Engineering program requires a grade of a C or better for any transfer credit course that is applied to the degree program (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements for either required or elective courses.

**International Perspectives: 3 cr.**<sup>1</sup>**U.S. Diversity: 3 cr.**<sup>1</sup>**Communication Proficiency/Library requirements:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
Business Communication Elective: one course of the following with a minimum grade of C.		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>10</b>

**Social Sciences and Humanities: 12 cr.**

Social Sciences and Humanities	<sup>2</sup>	6
International Perspectives	<sup>1</sup>	3
U.S. Diversity	<sup>1</sup>	3
<b>Total Credits</b>		<b>12</b>

**Basic Program: 24 cr.**<sup>3</sup>

Minimum GPA of 2.00 required for this set of courses to graduate, (please note that transfer course grades will not be calculated into the Basic Program GPA).<sup>3</sup>

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
C E 160	Engineering Problems with Computational Laboratory	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Math and Physical Science: 12 cr.**

STAT 305	Engineering Statistics	3
or STAT 231	Probability and Statistical Inference for Engineers	
MATH 267	Elementary Differential Equations and Laplace Transforms	4
PHYS 232	Introduction to Classical Physics II	4

PHYS 232L	Introduction to Classical Physics II Laboratory	1
<b>Total Credits</b>		<b>12</b>

**Construction Engineering Core: 27 cr. Minimum 2.00 GPA for this set of courses to graduate (please note that transfer course grades will not be calculated into the Core GPA):**

CON E 241	Construction Materials and Methods	3
C E 274	Engineering Statics	3
C E 332	Structural Analysis I	3
E M 324	Mechanics of Materials	3
CON E 422	Construction Cost Estimating and Cost Engineering	3
CON E 441	Construction Planning, Scheduling, and Control	3
A B E 378	Mechanics of Fluids	3
CON E 487	Construction Engineering Design I	3
CON E 488	Construction Engineering Design II	3
<b>Total Credits</b>		<b>27</b>

**Select remaining courses from one of the following options:****Building Option 27 cr:**

C E 360	Geotechnical Engineering	4
CON E 322	Construction Equipment and Heavy Construction Methods	3
CON E 340	Concrete and Steel Construction	3
C E 333	Structural Steel Design I	3
C E 334	Reinforced Concrete Design I	3
C E 383	Design of Portland Cement Concrete	1
CON E 352	Mechanical Systems in Buildings	3
CON E 353	Electrical Systems in Buildings	3
E M 327	Mechanics of Materials Laboratory	1
Engineering Topics Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>27</b>

**Electrical Option 26 cr:**

E E 201	Electric Circuits	4
E E 230	Electronic Circuits and Systems	4
E E 303	Energy Systems and Power Electronics	3
CON E 352	Mechanical Systems in Buildings	3
CON E 353	Electrical Systems in Buildings	3
E E 456	Power System Analysis I	3
E E 457	Power System Analysis II	3
Engineering Topics Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>26</b>

**Infrastructure Option 26 cr:**

C E 360	Geotechnical Engineering	4
CON E 322	Construction Equipment and Heavy Construction Methods	3
CON E 340	Concrete and Steel Construction	3
C E 333	Structural Steel Design I	3
C E 334	Reinforced Concrete Design I	3
C E 382	Design of Concretes	3
E M 327	Mechanics of Materials Laboratory	1
Engineering Topics Elective <sup>2</sup>		6

**Total Credits** **26**

**Mechanical Option 26 cr:**

M E 231	Engineering Thermodynamics I	3
M E 436	Heat Transfer	4
CON E 352	Mechanical Systems in Buildings	3
CON E 353	Electrical Systems in Buildings	3
E E 442	Introduction to Circuits and Instruments	2
E E 448	Introduction to AC Circuits and Motors	2
M E 441	Fundamentals of Heating, Ventilating, and Air Conditioning	3
M E 442	Heating and Air Conditioning Design	3
Engineering Topics Elective <sup>2</sup>		3

**Total Credits** **26**

**Additional Required Courses: 26 cr.**

CON E 121	Cornerstone Learning Community: Orientation to Academic Life	1
CON E 122	Cornerstone Learning Community: Orientation to Professional Life	1
CON E 222	Contractor Organization and Management of Construction	3
CON E 251	Mechanical/Electrical Materials and Methods	1
C E 111	Geomatics	3
C E 170	Graphics for Civil Engineering	2
I E 305	Engineering Economic Analysis	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
Law Elective		3
CON E 380	Engineering Law	
ACCT 215	Legal Environment of Business	
Business Communication Elective (minimum grade of C)		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	

Complete one course from Math or Stat Elective <sup>2</sup>	3
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**Total Credits** **26**

**Co-op/Internships - Optional**

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list (<http://www.ccee.iastate.edu/academics/advising/construction-engineering-student-forms/>).
3. See Basic Program for Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program <https://www.engineering.iastate.edu/classification/students/basic-program/>

See also: A 4-year plan of study grid showing course template by semester for a building option in Construction Engineering.

See also: A 4-year plan of study grid showing course template by semester for an electrical option in Construction Engineering.

See also: A 4-year plan of study grid showing course template by semester for a infrastructure option in Construction Engineering.

See also: A 4-year plan of study grid showing course template by semester for a mechanical option in Construction Engineering.

Construction Engineering, B.S. building option

**First Year**

Fall	Credits Spring	Credits
CON E 121	1 CON E 122	1
C E 160	3 C E 170	2
MATH 165	4 MATH 166	4
CHEM 167	4 ENGL 250	3
ENGL 150	3 PHYS 231	4
ENGR 101	R PHYS 231L	1
	LIB 160	1
	<b>15</b>	<b>16</b>

**Second Year**

Fall	Credits Spring	Credits
CON E 222	3 CON E 241	3
C E 111	3 CON E 251	1
Math or Stat Elective	3 MATH 267	4
SSH Elective	3 C E 274	3
PHYS 232	4 I E 305	3

PHYS 232L	1	
	<b>17</b>	<b>14</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 322	3 CON E 340	3
CON E 352	3 Law Elective (ConE 380 or Acct 215)	3
CON E 353	3 C E 360	4
STAT 231 or 305	3 C E 332	3
E M 324	3 A B E 378	3
SSH Elective	3 E M 327	1
	<b>18</b>	<b>17</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 422	3 CON E 487	3
CON E 441	3 CON E 488	3
C E 383	1 Business Comm Elective (ENGL 302 or 309 or 314)	3
C E 333	3 C E 334	3
Engr Topics Elective	3 SSH Elective (International Perspective)	3
SSH Elective (US Diversity)	3	
	<b>16</b>	<b>15</b>

Construction Engineering, B.S. electrical option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 121	1 CON E 122	1
C E 160	3 C E 170	2
MATH 165	4 MATH 166	4
CHEM 167	4 ENGL 250	3
ENGL 150	3 PHYS 231	4
ENGR 101	R PHYS 231L	1
	LIB 160	1
	<b>15</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 222	3 CON E 241	3
C E 111	3 CON E 251	1
MATH or STAT Elective	3 MATH 267	4
SSH Elective	3 C E 274	3
PHYS 232	4 I E 305	3

PHYS 232L	1	
	<b>17</b>	<b>14</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 352	3 Law Elective (ConE 380 or Acct 215)	3
CON E 353	3 E E 230	4
STAT 231 or 305	3 E E 303	3
E M 324	3 A B E 378	3
E E 201	4 SSH Elective	3
	<b>16</b>	<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 422	3 CON E 487	3
CON E 441	3 CON E 488	3
E E 456	3 E E 457	3
C E 332	3 Business Comm Elective (ENGL 302 or 309 or 314)	3
Engineering Topics Elective	3 SSH Elective (International Perspective)	3
SSH Elective (US Diversity)	3	
	<b>18</b>	<b>15</b>

Construction Engineering, B.S. infrastructure option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 121	1 CON E 122	1
C E 160	3 C E 170	2
MATH 165	4 MATH 166	4
CHEM 167	4 ENGL 250	3
ENGL 150	3 PHYS 231	4
ENGR 101	R PHYS 231L	1
	LIB 160	1
	<b>15</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 222	3 CON E 241	3
C E 111	3 CON E 251	1
Math or Stat Elective	3 MATH 267	4
SSH Elective	3 C E 274	3
PHYS 232	4 I E 305	3
PHYS 232L	1	
	<b>17</b>	<b>14</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 322	3 CON E 340	3
Law Elective (ConE 380 or Acct 215)	3 C E 332	3
STAT 231 or 305	3 C E 360	4
E M 324	3 C E 382	3
A B E 378	3 E M 327	1
SSH Elective	3 SSH Elective (US Diversity)	3
	<b>18</b>	<b>17</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 441	3 CON E 487	3
Engineering Topics Elective	3 CON E 488	3
CON E 422	3 Engineering Topics Elective	3
C E 333	3 C E 334	3
SSH Elective (International Perspective)	3 Business Comm Elective (ENGL 302 or 309 or 314)	3
	<b>15</b>	<b>15</b>

Construction Engineering, B.S. mechanical option

**First Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 121	1 CON E 122	1
C E 160	3 C E 170	2
MATH 165	4 MATH 166	4
CHEM 167	4 ENGL 250	3
ENGL 150	3 PHYS 231	4
ENGR 101	R PHYS 231L	1
	LIB 160	1
	<b>15</b>	<b>16</b>

**Second Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 222	3 CON E 241	3
C E 111	3 CON E 251	1
Math/Stat Elective	3 MATH 267	4
SSH Elective	3 C E 274	3
PHYS 232	4 I E 305	3
PHYS 232L	1	
	<b>17</b>	<b>14</b>

**Third Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 352	3 Law Elective (ConE 380 or Acct 215)	3
CON E 353	3 E E 442	2
STAT 231 or 305	3 E E 448	2
E M 324	3 C E 332	3
M E 231	3 A B E 378	3
SSH Elective	3 SSH Elective (US Diversity)	3
	<b>18</b>	<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
CON E 422	3 CON E 487	3
CON E 441	3 CON E 488	3
M E 436	4 M E 442	3
M E 441	3 Business Comm Elective (ENGL 302 or 309 or 314)	3
Engineering Topics Elective	3 SSH Elective (International Perspective)	3
	<b>16</b>	<b>15</b>

A concurrent bachelor of science/master of science (B.S./M.S.) degree program is available to qualified seniors at Iowa State University.

Go to <https://www.ccee.iastate.edu/prospective-graduate-students/concurrent-programs/> for further information.

## Graduate Study

An area of specialization in construction engineering and management is offered within the graduate program of the Department of Civil, Construction and Environmental Engineering. This specialization focuses on project management including and beyond the traditional iron triangle of scope, technical, and schedule to include context and financing, enabling project management of more complex projects. Three graduate degrees including, Master of Engineering (30 credits), Master of Science (30 credits), and Doctor of Philosophy (72 credits) are offered. The Master of Engineering degree is a coursework only option and the other degree programs require a research component at a level adjusted to the degree sought. All degrees are offered on-campus and some degrees may be completed off-campus through distance education. All degrees require C E 501, C E 502, C E 503, and a minimum of nine additional credits within construction focused C E courses. Course options include but are not limited to:

C E 501	Preconstruction Project Engineering and Management	3
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C E 502	Construction Project Engineering and Management	3
C E 503	Construction Finance and Business Management	3
C E 505	Design of Construction Systems	3
C E 594A	Special Topics Construction Engineering and Mgt.: Planning and Scheduling	3
C E 594L	Spl Topics Construction Engr and Mgt.: Adv Building Construction Topics - LEED for New Construction	3

Undergraduate students may also qualify for the concurrent bachelor of science/master of science (BS/MS) degree program. Courses are offered for minor work to students taking major work in other curricula or in interdepartmental programs. A graduate certificate is also available which requires 12 credits of coursework. Courses required for the certificate are C E 501, C E 502, and C E 503. For additional information see Civil Engineering, Graduate Programs, <https://www.ccee.iastate.edu/academics/graduate/>.

## Cyber Security Engineering

[www.ece.iastate.edu](http://www.ece.iastate.edu) (<http://www.ece.iastate.edu/>)

### Administered by the Department of Electrical and Computer Engineering

For the undergraduate curriculum in cyber security engineering leading to the degree Bachelor of Science. The Cyber Security Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The Department of Electrical and Computer Engineering (ECpE) at Iowa State University provides undergraduate students with the opportunity to learn computer engineering fundamentals, study applications of the most recent advances in state-of-the-art technologies, and to prepare for the practice of cyber security engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

**Student Learning Outcomes:** Graduates of the Cyber Security Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** The program objectives for the cyber security engineering program describe accomplishments that graduates are expected to attain within five years after graduation. Graduates will have applied their expertise to contemporary problem solving, be engaged professionally, have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives for expertise, engagement, learning, leadership and teamwork are defined below for the program.

The objectives of the cyber security engineering program at Iowa State University are:

- Graduates, within five years of graduation, should demonstrate peer-recognized **expertise** in computer security principles together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and operation of the physical, software and human components of a system, including system integration and implementation.
- Graduates, within five years of graduation, should demonstrate **engagement** in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.
- Graduates, within five years of graduation, should demonstrate sustained **learning** and adapting to a constantly changing field through graduate work, professional development, and self study.
- Graduates, within five years of graduation, should demonstrate **leadership** and initiative to ethically advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.
- Graduates, within five years of graduation, should demonstrate a commitment to **teamwork** while working with others of diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the ECpE department provides opportunities for each student to have experience with



broadening activities. Through the cooperative education and internship program, students have the opportunity to gain practical industry experience. Students have the opportunity to participate in advanced research activities, and through international exchange programs, students learn about engineering practices in other parts of the world. Well-qualified juniors and seniors in cyber security engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science.

## Curriculum in Cyber Security Engineering

Administered by the Department of Electrical and Computer Engineering.

Leading to the degree Bachelor of Science.

### Total credits required: 125

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.**

**Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

**Communication Proficiency/Library requirement:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Proposal and Report Writing (C or better in this course)	

### General Education Electives: 21 cr.

<sup>3</sup>

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course.)	3
ENGL 314	Technical Communication (Must have a C or better in this course.)	3
or ENGL 309	Proposal and Report Writing	
Complete minimum of 3 cr. from Approved General Education Component 300 level and above.		3
Complete additional 12 cr. from Approved General Education Component.		12
<b>Total Credits</b>		<b>21</b>

### Basic Program: 24 cr.

**A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.**

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
CPR E 185	Introduction to Computer Engineering and Problem Solving I	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 17 cr.

COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4
STAT 330	Probability and Statistics for Computer Science	3
Math Elective		3
<b>Total Credits</b>		<b>17</b>

### Cyber Security Engineering Core: 37 cr.

**(A minimum GPA of 2.00 required for this set of courses, including any transfer courses; please note that transfer course grades will not be calculated into the Core GPA).**

CYB E 230	Cyber Security Fundamentals	3
CYB E 231	Cyber Security Concepts and Tools	3
CYB E 234	Legal, Professional, and Ethical Issues in Cyber Systems	3
CYB E 331	Application of Cryptographic Concepts to Cyber Security	3
CPR E 281	Digital Logic	4
CPR E 288	Embedded Systems I: Introduction	4
CPR E 308	Operating Systems: Principles and Practice	4
CPR E 310	Theoretical Foundations of Computer Engineering	3
CPR E 381	Computer Organization and Assembly Level Programming	4
COM S 309	Software Development Practices	3

COM S 311	Introduction to the Design and Analysis of Algorithms	3
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<b>Total Credits</b>		<b>37</b>
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**Other Remaining Courses: 26 cr.**

CPR E 491	Senior Design Project I and Professionalism	3
CPR E 492	Senior Design Project II	2
Cyber Security	Technical Electives <sup>3</sup>	12
Computer Engineering	Technical Electives <sup>3</sup>	3
Technical Electives <sup>3</sup>		6

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<b>Total Credits</b>		<b>26</b>
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**Seminar/Co-op/Internships <sup>4</sup>:**

CPR E 166	Professional Programs Orientation	R
CPR E 494	Portfolio Assessment	R

**Transfer Credit Requirements**

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a B.S. in computer engineering. These 30 credits must include CPR E 491 Senior Design Project I and Professionalism, CPR E 492 Senior Design Project II, and credits in the core professional curriculum and/or in technical electives. The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass, but are used to meet the general education electives.
2. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.
3. From department approved lists. (<http://www.ece.iastate.edu/academics/bachelors-degree-requirements/>)
4. Co-op / Internships are optional

See also: A 4-year plan of study grid showing course template by semester.

Note: International perspectives and U.S. diversity courses are used to meet the general education electives.

Cyber Security Engineering, B.S.

**First Year**

Fall	Credits	Spring	Credits
CHEM 167	4	COM S 227	4
CPR E 185	3	CPR E 166	R
ENGL 150	3	MATH 166	4
ENGR 101	R	PHYS 231	4
LIB 160	1	PHYS 231L	1
MATH 165	4	General Education Elective	3
	<b>15</b>		<b>16</b>

**Second Year**

Fall	Credits	Spring	Credits
CPR E 281	4	CPR E 288	4
COM S 228	3	ENGL 250	3
MATH 267	4	Math Elective	3
CYB E 230	3	CYB E 231	3
		CYB E 234	3
	<b>14</b>		<b>16</b>

**Third Year**

Fall	Credits	Spring	Credits
CPR E 381	4	CPR E 308	4
CPR E 310	3	COM S 311	3
COM S 309	3	ENGL 314 or ENGL 309	3
CYB E 331	3	General Education Elective	3
General Education Elective	3	Cyber Security Elective	3
	<b>16</b>		<b>16</b>

**Fourth Year**

Fall	Credits	Spring	Credits
CPR E 491	3	CPR E 492	2
CPR E 494	R	Tech Elective	6
STAT 330	3	General Education Elective	3
Cyber Security Elective	6	Cyber Security Elective	3
CPR E Elective	3		
General Education Elective	3		
	<b>18</b>		<b>14</b>

## Cyber Security Engineering Minor

The cyber security engineering minor is intended for students studying computer engineering, computer science, software engineering, or management information systems with the goal of enabling them to work in cyber security. The minor consists of a series of lab based courses that are designed to provide students with both the technical background and the hands-on experiences along with the theoretical background to allow them to compete for jobs in cyber security.

Cyber Security Engineering students have the opportunity to become a concurrent undergraduate/graduate student in a few programs.

## **CONCURRENT B.S./M.ENG OR M.S. IN COMPUTER ENGINEERING**

## **CONCURRENT B.S./M.ENG OR M.S. IN ELECTRICAL ENGINEERING**

## **CONCURRENT B.S./M.ENG OR M.S. IN CYBER SECURITY**

Cyber Security Engineering students have the opportunity to begin their coursework towards their masters degree in computer engineering, cyber security during, or electrical engineering their final semester(s) of undergraduate coursework. In order to be eligible, student must have a 3.0 cumulative GPA or higher to begin a Masters of Engineering ("M.ENG") degree or a 3.3 cumulative GPA to begin a Masters of Science ("M.S.") degree. Students should meet with their academic advisor to discuss this option.

## **CONCURRENT B.S./MBA**

Juniors and Seniors have the opportunity to continue their undergraduate coursework while also pursuing a Master of Business Administration (MBA) degree. For additional information please visit the concurrent MBA website [www.ivybusiness.iastate.edu/full-time-concurrent-mba](http://www.ivybusiness.iastate.edu/full-time-concurrent-mba) (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

The department offers work for the degrees Master of Science and Doctor of Philosophy with a major in cyber security and minor work to students with other majors. Minor work for cyber security majors is usually selected from a wide range of courses outside cyber security.

Master of Engineering degree is coursework only. It is recommended for off-campus students.

The degree Master of Science with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component.

The department also offers a graduate certificate program in cyber security.

The normal prerequisite to major in graduate work in cyber security is the completion of undergraduate work substantially equivalent to that required of cyber security students at this university. Because of the diversification in the cyber security graduate program, however, it is possible for a student to qualify for graduate study in certain areas of cyber security even though the student's undergraduate or prior graduate training has been in a discipline other than cyber security. Supporting work, if required, will depend on the student's background and area of

research interest. Prospective students from a discipline other than cyber security are required to submit, with the application for admission, a statement of the proposed area of graduate study.

The department requires submission of GRE General test scores by applicants. All students whose first language is not English and who have no U.S. degree must submit TOEFL examination scores. Students pursuing the Doctor of Philosophy must complete the department qualifying process.

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental Master of Science and Doctor of Philosophy degree programs in bioinformatics and computational biology. Students interested in these programs may earn their degrees while working under an advisor in electrical and computer engineering.

Well-qualified juniors or seniors in cyber security who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science degrees, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Student Services Office and on the department's website.

## **Cyber Security Minor**

The minor is intended for students studying computer engineering, computer science, software engineering, or management information systems with the goal of enabling them to work in cyber security. The minor consists of a series of lab based courses that are designed to provide students with both the technical background and the hands-on experiences along with the theoretical background to allow them to compete for jobs in cyber security.

## **Objectives**

The minor in cyber security is designed to prepare students with the technical skills for entry into cybersecurity positions in industry or government agencies.

A few years after graduation, students completing the cyber security minor should be:

1. Contributing to their communities and society in the area of cyber security technology and applications and demonstrating an understanding of contemporary security issues, both technological and societal.
2. Advancing in their careers through application of their knowledge of cyber security

3. Working effectively as team members and demonstrating ethics and responsible behavior
4. Applying cyber security methods and concepts to the general area of their BS degree
5. Continuing their professional development through life-long learning

## Learning Outcomes

After earning the minor in cyber security students will

1. Demonstrate the ability to apply knowledge of cyber security concepts, tools and technologies to computer systems.
2. Understand cyber security risks, threats and countermeasures and apply this understanding to develop cyber defense strategies.
3. Demonstrate the ability to design cyber security systems to meet organizational needs within realistic constraints such as economic, environmental, social, and ethical expectations.
4. Demonstrate the ability to function on teams.

The minor requires 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Below is the list of courses used in the minor.

Core		
CYB E 230	Cyber Security Fundamentals	3
CYB E 231	Cyber Security Concepts and Tools	3
CYB E 331	Application of Cryptographic Concepts to Cyber Security	3
Plus one of the following (3-4 cr.)		3
CPR E 308	Operating Systems: Principles and Practice	
COM S 252	Linux Operating System Essentials	
COM S 352	Introduction to Operating Systems	
One Elective Course <sup>1</sup>		3
<b>Total Credits</b>		<b>15</b>

1. From department approved lists.

## Cyber-Physical Systems Minor

With the fourth industrial revolution upon us, physical systems are being designed to have a cyber component, that enables remote access, monitoring and control. In these systems, ubiquitous sensing, and advanced data management capability are taking us from automation to autonomy via a deep interconnection between the cyber and physical entities. Cyber-physical systems (CPS) are becoming abundant in many application sectors including manufacturing, energy, health care,

transportation and agriculture. Safety-, time- and life-critical systems are relying on CPS concepts to become more efficient, robust, resilient, flexible and scalable. As CPS applications become more pervasive, the engineering education system needs to produce a next generation CPS workforce who can design, produce, and maintain these systems.

With this motivation and encouraged by the demand from the industry stakeholders of ISU College of Engineering, this CPS minor will focus on sensing, advanced information processing (data analytics and machine learning), and controls aspects of Cyber-Physical Systems. Specific CPS application sectors such as energy/power systems, manufacturing, biomedical devices, autonomous systems, transportation, and agriculture will be in focus.

The minor requires 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include 9 credits that are not used to meet any other department, college, or university requirement.

Required courses:

M E 280X	Design and Analysis of Cyber-Physical Systems	3
CPR E 287X	Cyber-Physical Systems	3
AER E 364X	Cyber-Physical Systems Application	3
Elective courses:		6

M E 370	Engineering Measurements
M E 411	Automatic Controls
M E 418	Mechanical Considerations in Robotics
M E 421	System Dynamics and Control
M E 456	Machine Vision
M E 475	Modeling and Simulation
E E 324	Signals and Systems II
E E 333	Electronic Systems Design
E E 425	Machine learning: A Signal Processing Perspective
E E 476	Control System Simulation
CPR E 230	Cyber Security Fundamentals
CPR E 388	Embedded Systems II: Mobile Platforms
CPR E 414	Introduction to Software Systems for Big Data Analytics
CPR E 419	Software Tools for Large Scale Data Analysis
CPR E 421	Software Analysis and Verification for Safety and Security
CPR E 458	Real Time Systems
CPR E 488	Embedded Systems Design
A B E 403	Physical Modeling and Control of Dynamic Systems

A B E 404	Instrumentation for Agricultural and Biosystems Engineering
A B E 410	Electronic Systems Integration for Agricultural Machinery
I E 413	Stochastic Modeling, Analysis and Simulation
I E 432	Industrial Automation
I E 487	Big Data Analytics and Optimization
AER E 365X	Avionics and Controls Laboratory
AER E 407	Applied Formal Methods
AER E 433	Spacecraft Dynamics and Control
AER E 463	Introduction to Multidisciplinary Design Optimization
AER E 464	Spacecraft Systems
C E 449	Structural Health Monitoring
C E 553	Traffic Engineering
C E 556	Transportation Data Analysis

Total Credits

15

## Electrical Engineering

For the undergraduate curriculum in electrical engineering leading to the degree Bachelor of Science. The Electrical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

The Department of Electrical and Computer Engineering (ECpE) at Iowa State University provides undergraduate students with the opportunity to learn electrical and computer engineering fundamentals, study applications of the most recent advances in state-of-the-art technologies, and prepare for the practice of electrical engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment that is motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research and outreach programs.

The electrical engineering curriculum offers a number of emphasis areas at the undergraduate level, including control systems, electromagnetics and nondestructive evaluation, microelectronics and photonics, VLSI, electric power and energy systems, and communications and signal processing. Students are required to choose at least one course sequence that focuses on one of these areas; therefore graduates have substantial depth in specific areas to complement the breadth obtained in the required curriculum. Students also may take elective courses in computer networking, security, computer architecture, digital systems, and software.

**Student Learning Outcomes:** Graduates of the Electrical Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** The program objectives for the electrical engineering program describe accomplishments that graduates are expected to attain within five years after graduation. Graduates will have applied their expertise to contemporary problem solving, be engaged professionally, have continued to learn and adapt, and have contributed to their organizations through leadership and teamwork. More specifically, the objectives for expertise, engagement, learning, leadership and teamwork are defined below for each program.

The objectives of the electrical engineering program at ISU are:

- Graduates, within five years of graduation, should demonstrate peer-recognized **expertise** together with the ability to articulate that expertise and use it for contemporary problem solving in the analysis, design, and evaluation of electrical and electronic devices and systems.
- Graduates, within five years of graduation, should demonstrate **engagement** in the engineering profession, locally and globally, by contributing to the ethical, competent, and creative practice of engineering or other professional careers.
- Graduates, within five years of graduation, should demonstrate sustained **learning** and adapting to a constantly changing field through graduate work, professional development, and self study.
- Graduates, within five years of graduation, should demonstrate **leadership** and initiative to ethically advance professional and organizational goals, facilitate the achievements of others, and obtain substantive results.

- Graduates, within five years of graduation, should demonstrate a commitment to **teamwork** while working with others of diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the ECpE department provides opportunities for each student to have experience with broadening activities. Through the cooperative education and internship program, students have the opportunity to gain practical industry experience.

Students have the opportunity to participate in advanced research activities, and through international exchange programs, students learn about engineering practices in other parts of the world. Well-qualified juniors and seniors in electrical engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees.

Courses for students who are not in the electrical engineering program: E E 442 Introduction to Circuits and Instruments, E E 448 Introduction to AC Circuits and Motors. Credit in these courses may not be counted toward a degree in either electrical engineering or computer engineering.

## Curriculum in Electrical Engineering

Administered by the Department of Electrical and Computer Engineering.

Leading to the degree Bachelor of Science.

### Total credits required: 128.

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.**

**Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

**Communication Proficiency/Library requirement:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
ENGL 314	Technical Communication (C or better in this course)	
ENGL 309	Proposal and Report Writing (C or better in this course)	

### General Education Electives: 18 cr.

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course.)	3
ENGL 314 or ENGL 309	Technical Communication (Must have a C or better in this course.) Proposal and Report Writing	3
Complete minimum of 3 cr. from Approved General Education Component 300 level and above. <sup>2</sup>		3
Complete additional 9cr. from Approved General Education Component. <sup>2</sup>		9
<b>Total Credits</b>		<b>18</b>

### Basic Program: 24 cr.

**A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.**

CHEM 167 or CHEM 177	General Chemistry for Engineering Students General Chemistry I	4
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
E E 185	Introduction to Electrical Engineering and Problem-Solving I <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 16 cr.

MATH 207	Matrices and Linear Algebra	3
MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
PHYS 232	Introduction to Classical Physics II	4
<b>Total Credits</b>		<b>15</b>

### Electrical Engineering Core: 44 cr.

**(A minimum GPA of 2.00 required for this set of courses, including any transfer courses; please note that transfer course grades will not be calculated into the Core GPA).**

CPR E 281	Digital Logic	4
CPR E 288	Embedded Systems I: Introduction	4
E E 201	Electric Circuits	4
E E 224	Signals and Systems I	4
E E 230	Electronic Circuits and Systems	4



E E 232	Professional and Ethical Issues in Electrical and Computer Engineering	3
E E 285	Problem Solving Methods and Tools for Electrical Engineering	4
E E 303	Energy Systems and Power Electronics	3
E E 311	Electromagnetic Fields and Waves	4
E E 322	Probabilistic Methods for Electrical Engineers	3
Core Elective: one of the following:		7
E E 321	Communication Systems I	
E E 324	Signals and Systems II	
Core Elective: one of the following:		
E E 330	Integrated Electronics	
E E 332	Semiconductor Materials and Devices	
<b>Total Credits</b>		<b>44</b>

Note: E E 321 and E E 332 are 3-credit courses, whereas E E 324 and E E 330 are 4-credit courses. The core credit requirement (44 credits) assumes 7 credits taken for these options. Any core credit surplus or deficiency can be used as credits for E E technical electives.

#### Other Remaining Courses: 26 cr.

E E 491	Senior Design Project I and Professionalism	3
E E 492	Senior Design Project II	2
Econ Elective (ECON 101, 102 or IE 305)		3
E E/Cpr E Technical Electives including one approved sequence <sup>2</sup>		13
Technical Electives <sup>2</sup>		6
<b>Total Credits</b>		<b>27</b>

#### Seminar/Co-op/Internships:

E E 166	Professional Programs Orientation	R
E E 494	Portfolio Assessment	R
Co-op or internship is optional		

Outcomes Assessment - Students are required to prepare and to maintain a portfolio of their technical and non-technical skills. This portfolio is evaluated for student preparation during the student's curriculum planning process. Results of the evaluation are used to advise students of core strengths and weaknesses.

#### Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a B.S. in electrical engineering. These 30 credits must include E E 491 Senior Design Project I and Professionalism, E E 492 Senior Design Project II, and credits in the core professional curriculum and/or in technical electives. The Electrical and Computer Engineering Department requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. From department approved lists (<http://www.ece.iastate.edu/academics/bachelors-degree-requirements/>).
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also: A 4-year plan of study grid showing course template by semester.

Note: International perspectives and U.S. diversity courses are used to meet the general education electives.

Electrical Engineering, B.S.

#### First Year

Fall	Credits Spring	Credits
ENGR 101	R MATH 166	4
E E 185	3 E E 285	4
MATH 165	4 PHYS 231	4
CHEM 167	4 PHYS 231L	1
ENGL 150	3 E E 166	R
LIB 160	1 General Education Elective	3
	<b>15</b>	<b>16</b>

#### Second Year

Fall	Credits Spring	Credits
E E 201	4 CPR E 281	4
PHYS 232	4 E E 230	4
MATH 267	4 E E 224	4
ENGL 250	3 MATH 265	4
	<b>15</b>	<b>16</b>

#### Third Year

Fall	Credits Spring	Credits
CPR E 288	4 EE 330 or EE 332	3-4
E E 232	3 EE 321 or EE 324	3-4
E E 303	3 E E 322	3
E E 311	4 ENGL 314 or ENGL 309	3
MATH 207	3 General Education Elective	3
	<b>17</b>	<b>15-17</b>

#### Fourth Year

Fall	Credits Spring	Credits
E E 491	3 E E 492	2

E E 494	R Technical Electives	10
Technical Electives	9 General Education Electives	6
Econ Elective (Econ 101, 102 or IE 305)	3	
	<b>15</b>	<b>18</b>

Actual Total Credits: 128

Electrical Engineering students have the opportunity to become a concurrent undergraduate/graduate student in a few programs.

## CONCURRENT B.S./M.ENG OR M.S. IN COMPUTER ENGINEERING

## CONCURRENT B.S./M.ENG OR M.S. IN CYBER SECURITY

## CONCURRENT B.S./M.ENG OR M.S. IN ELECTRICAL ENGINEERING

Electrical engineering students have the opportunity to begin their coursework towards their masters degree in computer, cyber security or electrical engineering during their final semester(s) of undergraduate coursework. In order to be eligible, student must have a 3.0 cumulative GPA or higher to begin a Masters of Engineering ("M.ENG") degree or a 3.3 cumulative GPA to begin a Masters of Science ("M.S.") degree. Students should meet with their academic advisor to discuss this option.

## CONCURRENT B.S./MBA

Juniors and Seniors have the opportunity to continue their undergraduate coursework while also pursuing a Master of Business Administration (MBA) degree. For additional information please visit the concurrent MBA website [www.ivybusiness.iastate.edu/full-time-concurrent-mba](http://www.ivybusiness.iastate.edu/full-time-concurrent-mba) (<https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>).

## Graduate Study

The department offers work for the degrees Master of Engineering, Master of Science, and Doctor of Philosophy with a major in electrical engineering and minor work to students with other majors. Minor work for electrical engineering majors is usually selected from a wide range of courses outside electrical engineering.

Master of Engineering degree is coursework only. It is recommended for off-campus students.

The degree Master of Science with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component.

The department also offers a graduate certificate program in power systems engineering.

The normal prerequisite to major in graduate work in electrical engineering is the completion of undergraduate work substantially equivalent to that required of electrical engineering students at this university. Because of the diversification in the electrical engineering graduate program, however, it is possible for a student to qualify for graduate study in certain areas of electrical engineering even though the student's undergraduate or prior graduate training has been in a discipline other than electrical engineering. Supporting work, if required, will depend on the student's background and area of research interest. Prospective students from a discipline other than electrical engineering are required to submit, with the application for admission, a statement of the proposed area of graduate study.

The department requires submission of GRE General test scores by applicants. All students whose first language is not English and who have no U.S. degree must submit TOEFL examination scores. Students pursuing the Doctor of Philosophy must complete the department qualifying process.

The Department of Electrical and Computer Engineering is a participating department in the interdepartmental Master of Science and Doctor of Philosophy degree programs in bioinformatics and computational biology. Students interested in these programs may earn their degrees while working under an advisor in electrical and computer engineering.

Well-qualified juniors or seniors in electrical engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science degrees, the Bachelor of Science and Master of Business Administration, or the Bachelor of Science and Master of Engineering degrees. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Student Services Office and on the department's website.

## Energy Systems Minor

## Energy Systems Engineering Minor

Energy systems are pervasive in our society. A list of energy-related subjects and applications in the engineering curriculum would be nearly endless, but here are some examples:

- Mechanical engineers have a core area in thermo-fluids where courses in thermodynamics, fluid mechanics, and heat transfer form a base for energy systems.
- Electrical engineers address power transmission and distribution as well as electric motors and power systems.

- Civil engineers develop structures for wind turbines and hydroelectric dams.
- Construction engineers need to understand how building systems impact energy utilization.
- Chemical engineers develop alternative fuels and clean burning technologies.
- Material engineers develop new materials for batteries and fuel cells.
- Aerospace engineers develop wind turbines.
- Industrial engineers address manufacturing efficiency and energy reduction.
- Agricultural engineers develop biorenewable energy sources.

Energy systems are also a significant focus of the grand challenges of engineering (<http://www.engineeringchallenges.org/>), and this minor will help our students address these issues in their engineering careers.

The goal of the minor in energy systems is to provide ISU engineering students with focused educational opportunities in the broad area of energy systems. Successful energy systems minor students will understand broad energy perspectives, the language of energy systems, and the economic, environmental, and policy issues related to energy in the two required courses (six credits) for the minor (ECON 380 and E E 351 **OR** M E 433). *Note that credit for both E E 351 and M E 433 is no longer accepted.* The remaining nine credits in the minor can be selected from a list of approved engineering courses related to energy systems to give students the opportunity to extend their knowledge.

The Energy Systems minor is administered by the mechanical engineering department and is open to all undergraduates in the College of Engineering. The minor may be earned by completing 15 credits from the following course list. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. A complete list of approved elective courses can be found below.

#### Required Courses

ECON 380	Energy, Environmental and Resource Economics	3
E E 351	Analysis of Energy Systems	3
or M E 433	Alternative Energy	
Electives: Choose from list of approved courses as outlined below		9
<b>Total Credits</b>		<b>15</b>

#### Approved list of electives are as follows:

A B E 325 Biorenewable Systems  
 A B E 342 Agricultural Tractor Power  
 A B E 363 Agri-Industrial Applications of Electric Power and Electronics  
 A B E 380 Principles of Biological Systems Engineering  
 A B E 413 Fluid Power Engineering  
 A B E 472 Controlled Environments for Animals and Plants

A B E 480 Engineering Analysis of Biological Systems  
 A B E 572 Controlled Environments for Animals and Plants  
 A B E 580 Engineering Analysis of Biological Systems  
 AER E 381 Introduction to Wind Energy  
 AER E 570 Wind Engineering  
 CH E 356 Transport Phenomena I  
 CH E 357 Transport Phenomena II  
 CH E 358 Separations  
 CH E 381 Chemical Engineering Thermodynamics  
 CH E 382 Chemical Reaction Engineering  
 CH E 415 Biochemical Engineering  
 CH E 515 Biochemical Engineering  
 CH E 554 Integrated Transport Phenomena  
 CH E 583 Advanced Thermodynamics  
 CH E 587 Advanced Chemical Reactor Design  
 CON E 352 Mechanical Systems in Buildings  
 CON E 353 Electrical Systems in Buildings  
 CON E 354 Building Energy Performance  
 E E 303 Energy Systems and Power Electronics  
 E E 448 Introduction to AC Circuits and Motors  
 E E 452 Electrical Machines and Power Electronic Drives  
 E E 455 Introduction to Energy Distribution Systems  
 E E 456 Power System Analysis I  
 E E 457 Power System Analysis II  
 E E 458 Economic Systems for Electric Power Planning  
 E E 459 Electromechanical Wind Energy Conversion and Grid Integration  
 E E 552 Energy System Planning  
 E E 553 Steady State Analysis  
 E E 554 Power System Dynamics  
 E E 555 Advanced Energy Distribution Systems  
 E E 556 Power Electronic Systems  
 E E 559 Electromechanical Wind Energy Conversion and Grid Integration  
 E M 570 Wind Engineering  
 ENSCI 480 Engineering Analysis of Biological Systems  
 M E 332 Engineering Thermodynamics II  
 M E 335 Fluid Flow  
 M E 413 Fluid Power Engineering  
 M E 436 Heat Transfer  
 M E 437 Introduction to Combustion Engineering  
 M E 441 Fundamentals of Heating, Ventilating, and Air Conditioning  
 M E 442 Heating and Air Conditioning Design  
 M E 444 Elements and Performance of Power Plants  
 M E 448 Fluid Dynamics of Turbomachinery  
 M E 449 Internal Combustion Engines  
 M E 501 Fundamentals of Biorenewable Resources  
 M E 530 Advanced Thermodynamics  
 M E 532 Compressible Fluid Flow  
 M E 535 Thermochemical Processing of Biomass

M E 536 Advanced Heat Transfer  
 M E 538 Advanced Fluid Flow  
 M E 542 Advanced Combustion  
 M E 545 Thermal Systems Design  
 MAT E 311 Thermodynamics in Materials Engineering  
 M S E 520 Thermodynamics and Kinetics in Multicomponent Materials  
 WESEP 501 Wind Energy Resources  
 WESEP 502 Wind Energy Systems

<http://www.me.iastate.edu/energy-systems-minor/>

## Engineering Mechanics

Administered by the Department of Aerospace Engineering

### Undergraduate Study

The undergraduate courses in mechanics are intermediate between those in physics and mathematics and the professional and design courses of the several engineering curricula. In these courses the student is expected to acquire an understanding of the basic principles and analysis techniques pertaining to the static and dynamic behavior of rigid media, deformable solids, fluids, and gasses. Physical properties of engineering materials are studied in the classroom and are tested in the laboratory. General physical laws are given mathematical expression and are made suitable for use in the solution of specific problems in machine and structural design, and in the flow and measurement of fluids.

### Graduate Study

The department offers graduate programs that lead to the degrees master of science, master of engineering, and doctor of philosophy with major in engineering mechanics, and minor work to students taking major work in other departments.

The master of science degree requires a thesis and has strong research emphasis. The master of science degree is recommended for students who anticipate entering a doctoral program later. The master of engineering degree does not require either research credits or a thesis. The program is intended to give students additional instruction at the graduate level to better qualify them for advanced professional engineering work. By careful selection of electives and perhaps additional courses during the senior undergraduate year, students should be able to qualify for the master of engineering degree with an additional year of full-time study after receiving their baccalaureate degree in one of the several engineering curricula.

The master of engineering degree does require a creative component which will be obtained by registering for E M 599 Creative Component. A written report and an oral presentation will be given to the student's graduate committee.

At least 30 credits of acceptable graduate work are required for both the master of science and the master of engineering degrees. For specific course, research, and creative component requirements, see the departmental Graduate Student Handbook (<http://www.aere.iastate.edu/wp-content/blogs.dir/13/files/2011/09/Graduate-Handbook-Fall-2011.pdf>).

The normal prerequisite to major graduate work is the completion of a curriculum substantially equivalent to that required of undergraduate students in engineering at this university. However, because of the diversity of interests in graduate work in engineering mechanics, it is possible for a student to qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering—e.g., physics or mathematics.

#### Courses primarily for undergraduates:

##### **E M 324: Mechanics of Materials**

(3-0) Cr. 3. F.S.SS.

*Prereq:* C E 274

Plane stress, plane strain, stress-strain relationships, and elements of material behavior. Application of stress and deformation analysis to members subject to centric, torsional, flexural, and combined loadings. Elementary considerations of theories of failure, buckling.

##### **E M 327: Mechanics of Materials Laboratory**

(0-2) Cr. 1. F.S.

*Prereq:* E M 324

Experimental determination of mechanical properties of selected engineering materials. Experimental verification of assumptions made in 324. Use of strain measuring devices. Preparation of reports.

##### **E M 362: Principles of Nondestructive Testing**

(Cross-listed with MAT E). (3-0) Cr. 3. S.

*Prereq:* PHYS 132 or PHYS 232

Radiography, ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection, and other techniques. Physical bases of tests, materials to which applicable, types of defects detectable, calibration standards, and reliability safety precautions.

##### **E M 362L: Nondestructive Testing Laboratory**

(Cross-listed with MAT E). (0-3) Cr. 1. S.

*Prereq:* Credit or concurrent enrollment in E M 362 or MAT E 362

Application of nondestructive testing techniques to the detection and sizing of flaws in materials and to the characterization of material's microstructure. Included are experiments in hardness, dye penetrant, magnetic particle, x-ray, ultrasonic and eddy current testing. Field trips to industrial laboratories.

**E M 417: Experimental Mechanics**

(Dual-listed with E M 517). (Cross-listed with AER E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324; MAT E 273

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

**E M 424: Intermediate Mechanics of Materials**

(3-0) Cr. 3. F.S.

*Prereq:* E M 324

Analysis of stresses, strains, and deflections. Torsion and bending of unsymmetrical members. Analysis of thick wall pressure vessels and shrink fit problems. Dynamic load effects, fatigue and fracture mechanics introduction. Work-strain energy methods.

**E M 425: Introduction to the Finite Element Method**

(3-0) Cr. 3. S.

*Prereq:* E M 324; (MATH 266 or MATH 267)

Introduction of finite element analysis through applications to one-dimensional, steady-state problems such as elastic deformation, heat and fluid flow, consolidation, beam bending, and mass transport. Transient heat conduction and wave propagation. Two-dimensional triangular and quadrilateral elements. Plane problems of torsion, thermal and potential flow, stress analysis. Simple computer programs for one- and two-dimensional problems.

**E M 451: Engineering Acoustics**

(Cross-listed with E E, M E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* (MATH 266 or MATH 267); PHYS 231; PHYS 231L

The basics of acoustic wave propagation in fluids with an emphasis on sound propagation in air. Topics include transmission and reflection of sound at a boundary; role of acoustic sources in directing sound fields; diffraction of sound around solid objects; reverberation of sound in a room; and the measurement of sound fields.

**E M 480: Ultrasonic Nondestructive Evaluation**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq:* E M 324; (MATH 266 or MATH 267); PHYS 232

Introduction to stress/strain, Hooke's law, and elastic wave propagation in two dimensions in isotropic media. Ultrasonic plane-wave reflection and transmission; and simple straight-crested guided waves. Transducer construction, behavior, and performance. Simple signal analysis and discrete signal processing. The last few weeks of the course are devoted to case studies.

**E M 490: Independent Study**

Cr. arr. Repeatable.

*Prereq:* Permission of Instructor

**E M 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq:* Permission of Instructor

**Courses primarily for graduate students, open to qualified undergraduates:**

**E M 510: Continuum Mechanics**

(3-0) Cr. 3. F.

*Prereq:* MATH 385

Introduction to Cartesian tensors as linear vector transformations. Kinematics of continuous deformations, Lagrangian and Eulerian descriptions of motion. Fundamental equations or balance laws of continuous media, linear and angular momentum balance. Conservation laws of momentum and energy. Introduction to constitutive equations of classical elastic solids and simple fluids. Formulations and solutions of some canonical problems.

**E M 514: Advanced Mechanics of Materials**

(Cross-listed with AER E). (3-0) Cr. 3. F.

*Prereq:* E M 324

Theory of stress and strain, stress-strain relationships. Unsymmetrical bending, curved beams, shear center. Torsion of thin-walled noncircular sections. Equilibrium, compatibility equations. Airy stress functions. Membrane stresses in shells, thick-walled cylinders.

**E M 516: Applied Elasticity and Mechanics of Deformable Solids**

(3-0) Cr. 3. S.

*Prereq:* E M 510

Fundamental mechanics of linear elasticity, formulation and solution of simple elastostatic boundary value problems. Kinematics of small deformations, constitutive equations for isotropic and anisotropic media. Field equations for elastic solids, plane strain/plane stress and some classic analytical solutions such as Boussinesq, Hertz, Kirsch, Lamé, and Mitchell. Stress functions and potential methods and introduction to finite elements.

**E M 517: Experimental Mechanics**

(Dual-listed with E M 417). (Cross-listed with AER E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324; MAT E 273

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

**E M 518: Waves in Elastic Solids with Applications to Ultrasonic Nondestructive Evaluation**

(3-0) Cr. 3. F.

*Prereq:* MATH 385

Propagation of bulk waves, surface waves, and guided waves in isotropic and anisotropic elastic media. Transmission and reflection of waves at plane and curved interfaces. Radiation of sources with application to ultrasonic transducer beam modeling. Elastic wave scattering from cracks and inclusions. Reciprocity principles and their use in the development of an ultrasonic measurement model. Characterization and measurement of material attenuation.

**E M 525: Finite Element Analysis**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq:* E M 425, MATH 385

Variational and weighted residual approach to finite element equations. Emphasis on two- and three-dimensional problems in solid mechanics. Isoparametric element formulation, higher order elements, numerical integration, imposition of constraints and penalty, convergence, and other more advanced topics. Use of two- and three-dimensional computer programs. Dynamic and vibrational problems, eigenvalues, and time integration. Introduction to geometric and material nonlinearities.

**E M 526: Boundary Element Methods in Engineering**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 514 or E M 516

Introductory boundary element methods through plane problems. Singular integrals, Cauchy principal values, integral representations and boundary integrals in one dimension. Direct and indirect formulations. Plane potential and elastostatic problems. Higher order elements, numerical integration. Regularizations. Body forces and infinite regions. Specialized fundamental solutions, half-plane and axisymmetric problems. Diffusion and wave problems. Coupling with finite elements.

**E M 543: Introduction to Random Vibrations and Nonlinear Dynamics**

(Cross-listed with M E). (3-0) Cr. 3. Alt. S., offered odd-numbered years. Vibrations of continuous systems. Nonlinear vibration phenomena, perturbation expansions; methods of multiple time scales and slowly-varying amplitude and phase. Characteristics of random vibrations; random processes, probability distributions, spectral density and its significance, the normal or Gaussian random process. Transmission of random vibration, response of simple single and two-degree-of-freedom systems to stationary random excitation. Fatigue failure due to random excitation.

**E M 548: Advanced Engineering Dynamics**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* E M 345, MATH 266 or MATH 267

3-D kinematics and dynamics of particles and rigid bodies. Coordinate systems, calculus of variations. Lagrange's equations with constraints, modified Euler's equations, torque-free motion of rigid bodies in 3-D, moment equations with constraints.

**E M 550: Nondestructive Evaluation**

(Cross-listed with M S E). (3-2) Cr. 4. S.

*Prereq:* E M 324, MATH 385

Principles of five basic NDE methods and their application in engineering inspections. Materials behavior and simple failure analysis. NDE reliability, and damage-tolerant design. Advanced methods such as acoustic microscopy, laser ultrasonics, thermal waves, and computed tomography are analyzed. Computer-based experiments on a selection of methods: ultrasonics, eddy currents, x-rays are assigned for student completion.

**E M 564: Fracture and Fatigue**

(Cross-listed with AER E, M E, M S E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.

*Undergraduates:* Permission of instructor

Materials and mechanics approach to fracture and fatigue. Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**E M 566: Phase Transformation in Elastic Materials**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq:* EM 510 or EM 516 or EM 514

Continuum thermodynamics and kinetics approaches to phase transformations. Phase field approach to stress- and temperature-induced martensitic transformations and twinning at the nanoscale. Nucleation and growth. Nanostructural evaluation. Analytical and numerical solutions. Surface stresses and energy. Surface-induced phase transformations. Large Strain formulation.



**E M 567: Nanomechanics of Materials**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or consent of instructor*

Continuum theoretical and computational approaches to material deformation and nanostructure evolution. Thermodynamics and kinetics. Nucleation and growth. Surface and interface tension and phenomena. Chemical reactions, phase transformations, and dislocation evolution.

**E M 569: Mechanics of Composite and Combined Materials**

(Cross-listed with AER E, M S E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: E M 324*

Mechanics of fiber-reinforced materials. Micromechanics of lamina. Macromechanical behavior of lamina and laminates. Strength and interlaminar stresses of laminates. Failure criteria. Stress analysis of laminates. Thermal moisture and residual stresses. Joints in composites.

**E M 570: Wind Engineering**

(Cross-listed with AER E). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A B E 378, M E 345*

Atmospheric circulations, atmospheric boundary layer wind, bluff-body aerodynamics, aeroelastic phenomena, wind-tunnel and full-scale testing, wind-load code and standards, effect of tornado and thunderstorm winds, design applications.

**E M 580: Phase Transformations and Plasticity**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or permission of instructor*

Continuum approaches to phase transformations and plasticity at nano-, micro-, and macroscales. Interaction between phase transformations and plasticity and different scales. Temperature-, stress-, and strain-induced phase transformations. Transformation-induced plasticity. Thermodynamics and kinetics. Nucleation and growth. Large strain formulation. High pressure phenomena and theories.

**E M 584: High Pressure Mechanics and Phase Transformations**

(3-0) Cr. 3.

*Prereq: E M 566 or E M 510 or E M 514 or consent of instructor*

Techniques for producing static high pressure and measurements. Traditional and rotational diamond anvil cell. Phase diagrams. Pressure, stress, and plastic strain induced phase transformations: continuum thermodynamics and kinetics. Elasticity and plastic flow under high pressure. Transformation pressure hysteresis. Material synthesis and search for new phases. Interaction between phase transformations and plasticity under high pressure. High pressure mechanochemistry. Multiscale modeling.

**E M 586: Micromechanics of Structural Changes in Materials**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or permission of instructor.*

Continuum and micromechanical approaches to material deformation, phase transformations, and microstructure evolution. Thermodynamics and kinetics. Eshelby inclusion. Interface propagation and reorientation. Microscale phase field approach. Large strain formulation. Phase transformations, chemical reactions, twinning, and fracture.

**E M 590: Engineering Mechanics Special Topics**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor***E M 590F: Engineering Mechanics Special Topics: Introduction to Dislocation and Plasticity**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor***E M 590H: Engineering Mechanics Special Topics: Mechanics of Thin Films and Adhesives**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor***E M 590I: Engineering Mechanics Special Topics: Mechanics of Cellular and Porous Media**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor***E M 590J: Engineering Mechanics Special Topics: Other**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor***E M 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:****E M 690: Engineering Mechanics Special Topics**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 690N: Engineering Mechanics Special Topics: Advanced Experimental Methods**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 690O: Engineering Mechanics Special Topics: Advanced Wave Propagation**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690P: Engineering Mechanics Special Topics: Advanced Materials**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 690Q: Engineering Mechanics Special Topics: Advanced Computational Methods**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 690R: Engineering Mechanics Special Topics: Reliability and Failure**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 690S: Engineering Mechanics Special Topics: Other**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor***E M 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq: Permission of DOGE (Director of Graduate Education), graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**E M 699: Research**

Cr. arr. Repeatable.

## Engineering Sales Minor

With approximately 15% of engineering job postings involving product sales, marketing or customer field support, a minor in engineering sales can be a critical step towards a great job offer. Besides being one of the best paid positions in engineering, technical sales offers substantial travel opportunities and the ability to solve customers' engineering problems in the field working with people. Talk to your advisor to see how just a few additional courses could fit into your schedule and fast-track your job prospects.

To fill this need, the Department of Industrial and Manufacturing Systems Engineering has developed a minor in sales engineering. The engineering sales minor is a 15 credit minor that complements the technical training in the student's major discipline by providing the tools and knowledge required for technical (i.e. business-to-business) sales careers. The minor is available only to engineering students and is administered by a supervisory faculty committee. No more than 6 of the 15 credits can be used to meet any other department, college or university requirements.

### Requirements:

- I E 450 Technical Sales for Engineers
- I E 430 Entrepreneurial Product Engineering

- MKT 340 Principles of Marketing
- MKT 450 Advanced Professional Selling

AND

One of the following:

- I E 305 Engineering Economic Analysis
- C E 206 Engineering Economic Analysis and Professional Issues in Civil Engineering

The objectives of the minor are to provide a broad understanding of the technical sales process, primarily from the business-to-business perspective. At the conclusion of the minor, students will be able to:

- Calculate a return on investment and communicate this to the customer
- Determine payback period for a given solution and communicate this to the customer
- Perform a market segmentation
- Develop a client value analysis
- Perform prospecting and business-to-business marketing
- Identify decision makers and processes
- Manage a sales process
- Use sales automation software
- Apply knowledge of underlying international sales issues
- Prepare written and verbal sales presentations
- Provide information about product/service pricing
- Lead a team selling process
- Establish sales channel management procedures
- Develop sound distribution strategies and global sales processes
- Formulate bid strategies/negotiation strategies
- Employ good time management skills

Those students interested in pursuing this minor should contact an academic advisor in their home department and fill out a REQUEST FOR MINOR form. Evaluation of all students requesting this minor will be conducted in the Department of Industrial and Manufacturing Systems Engineering. Any questions should be directed to Ms. Devna Popejoy-Sheriff at [devna@iastate.edu](mailto:devna@iastate.edu).

## Environmental Engineering

<http://www.ccee.iastate.edu/>

**Administered by the Department of Civil, Construction and Environmental Engineering**

For undergraduate curriculum in environmental engineering leading to the degree bachelor of science.

Students in the environmental engineering bachelor's degree program will complete a curriculum covering the engineering and science knowledge necessary to design and implement effective, affordable solutions for environmental challenges involving water, air, and land. The environmental engineering curriculum equips students with a broad education that includes technical skills in analysis and design and professional practices such as communication, teamwork, leadership, and ethics. Graduates will have a strong foundation necessary to solve complex current and future infrastructure challenges within the diverse areas of environmental engineering.

Graduates of this program will be prepared to work in environmental engineering positions within the private and public (e.g., federal, military, state, and community) sectors that deal with pollution and contamination in all aspects of the built and natural environment. Examples of this work include analyzing and designing systems for water supply and distribution, collecting and processing waste, controlling air quality, recycling residuals, and protecting public health. Students interested in a more general education in civil engineering should consider the B.S. in civil engineering with environmental emphasis.

**Student Learning Outcomes:** Graduates of the Environmental Engineering curriculum should have, at the time of graduation:

- 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- 3. an ability to communicate effectively with a range of audiences
- 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

**Program Educational Objectives:** Three to five years after graduation, graduates of the environmental engineering program will have:

- 1. Pursued successful careers and expertise in environmental engineering or a related profession.

- 2. Collaborated effectively on multi-disciplinary teams to address the needs of society and the environment.
- 3. Pursued lifelong learning, professional development, and licensure as appropriate for their career goals.

The faculty encourages the students to develop their professional skills by participating in cooperative education, internships, or progressive summer engineering employment and study abroad programs. Qualified juniors and seniors interested in graduate studies may apply to the Graduate College to pursue concurrently the bachelor degree and either a master of science in Civil Engineering or a master of business administration in the College of Business Administration. These students would have an opportunity to graduate in five years with both degrees.

## Curriculum in Environmental Engineering

Administered by the Department of Civil, Construction and Environmental Engineering.

Leading to the degree bachelor of science.

### Total credits required: 131.

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements. International Perspectives: 3 cr.<sup>1</sup> U.S. Diversity: 3 cr.**

#### Communication Proficiency/Library requirement

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1

**Social Sciences and Humanities: 12 cr.<sup>2</sup>**  
Complete 12 cr. with 6 cr. at 200-level or above.

**Basic Program: 24 cr.<sup>3</sup> Minimum GPA of 2.00 required for this set of courses to graduate, including any transfer courses (please note that transfer course grades will not be calculated into the Basic Program GPA).**

CHEM 167	General Chemistry for Engineering Students	4-7
or CHEM 177	General Chemistry I	
& CHEM 178	and General Chemistry II	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
C E 160	Engineering Problems with Computational Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4

PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24-27</b>

**Math and Physical Science: 27 cr.**

CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II <sup>4</sup>	3
CHEM 178L	Laboratory in College Chemistry II <sup>4</sup>	1
CHEM 231	Elementary Organic Chemistry	3
BIOL 251	Biological Processes in the Environment	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
GEOL 201	Geology for Engineers and Environmental Scientists	3
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
MICRO 201	Introduction to Microbiology	2
Statistics Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>27</b>

**Env Engineering Core: 27 cr. Minimum GPA of 2.00 required for this set of courses to graduate (including transfer courses; please note that transfer course grades will not be calculated into the Core GPA).**

ENV E 201	Environmental Engineering Measurements and Analysis	3
C E 326	Principles of Environmental Engineering	3
C E 372	Engineering Hydrology and Hydraulics	3
A B E 378	Mechanics of Fluids	3
M E 231	Engineering Thermodynamics I	3
ENV E 426	Environmental Engineering Science	3
ENV E 427	Environmental Engineering Systems	3
ENV E 429	Air Pollution and Control	3
ENV E 430	Solid and Hazardous Waste Management	3
<b>Total Credits</b>		<b>27</b>

**Other Remaining Courses: 41 cr.**

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
Technical Communication Elective <sup>2</sup>		3
SP CM 212	Fundamentals of Public Speaking	3
ENV E 120	Environmental Engineering Learning Community	1
ENV E 190	Introduction to Undergraduate Research in Civil and Environmental Engineering	2
C E 306	Project Management for Civil Engineers	3
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	3
Sustainability Elective <sup>2</sup>		3

C E 274	Engineering Statics	3
C E 360	Geotechnical Engineering	4
E M 324	Mechanics of Materials	3
C E 428	Water and Wastewater Treatment Plant Design	3
A B E 378L	Mechanics of Fluids Laboratory	1
Engineering Topics Electives <sup>2</sup>		6
<b>Total Credits</b>		<b>41</b>

**Seminar/Co-op/Internships: R cr.****Co-op/Internship optional.****Notes.**

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list. (<http://www.ccee.iastate.edu/academics/advising/civil-engineering-student-forms/>)
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

**Freshman**

Fall	Credits Spring	Credits
C E 160	3 ENV E 190	2
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 MATH 166	4
MATH 165	4 PHYS 231	4
LIB 160	1 PHYS 231L	1
ENGR 101	R BIOL 251	3
ENV E 120	1	
<b>17</b>		<b>18</b>

**Sophomore**

Fall	Credits Spring	Credits
ENGL 250	3 C E 326	3
C E 274	3 C E 306	3
CHEM 231	3 A B E 378	3
CHEM 231L	1 A B E 378L	1
MATH 265	4 MATH 266	3
ENV E 201	3 Social Sciences and Humanities Elective	3
<b>17</b>		<b>16</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
C E 206	3 C E 372	3
Sustainability Elective	3 C E 360	4
E M 324	3 Technical Communication Elective	3
Statistics Elective	3 MICRO 201	2
GEOL 201	3 M E 231	3
SSH Elective	3	
	<b>18</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENV E 426	3 C E 428	3
ENV E 430	3 ENV E 427	3
Engineering Topics Elective	3 ENV E 429	3
SSH Elective (Intl. Perspective)	3 Engineering Topics Elective	3
SP CM 212	3 SSH Elective (U.S. Diversity)	3
	<b>15</b>	<b>15</b>

# Industrial Engineering

## Administered by the Department of Industrial and Manufacturing Systems Engineering

The undergraduate curriculum in Industrial Engineering leads to the degree Bachelor of Science.

The Industrial Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

## Program Educational Objectives

The Industrial Engineering (IE) Program educates its future graduates to accomplish its program educational objectives (PEO's) in their early careers.

Specifically, the IE Program prepares its majors so that, within a few years after graduation, graduates' attainments are

1. Industrial engineering solutions that are effectively created and communicated and consider relevant stakeholders and ramifications.
2. Team goal accomplishment through productive and inclusive interactions and leadership.
3. New capabilities, skills, and knowledge that advance professional practice and enable career advancement.

## Student Learning Outcomes

The IE Program currently has the following student outcomes describing what IE majors are expected to know and be able to do by the time of graduation.

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

The Industrial Engineering undergraduate curriculum provides students with fundamental knowledge in mathematics and science, engineering science, social science, and humanities as well as professional industrial engineering course work. In particular, the curriculum includes design, analysis, operation and improvement of integrated systems that produce or supply products or services in an effective, efficient, sustainable and socially responsible manner. Management electives provide students with an opportunity to become familiar with modern business practices that they will encounter in their career. A senior capstone design course provides students with an opportunity to solve open-ended industrial problems with an industrial partner. The cooperative education program provides students with real world experience in the profession and a good perspective on career choices. Students are encouraged to participate in international experiences through exchange programs and industrial internships.

Qualified juniors and seniors interested in graduate studies may apply to the Graduate College to concurrently pursue both B.S. and M.S. or M.Eng. degrees in Industrial Engineering, or B.S. and M.B.A. degrees. For further information please refer to Concurrent Undergraduate and Graduate Programs tab.

## Curriculum in Industrial Engineering

Administered by the Department of Industrial and Manufacturing Systems Engineering.

Leading to the degree Bachelor of Science.

### Total credits required: 122 cr.

**See also Basic Program and Special Programs. Grades of C or better are required for any transfer credit course that is applied to the degree program but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA. Note: Department does not allow Pass/Not Pass credits to be used to meet graduation requirements.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

**Communication Proficiency/Library requirements:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1

### Remaining Communication courses: 9 cr.

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or Better in this course)	3
SP CM 212	Fundamentals of Public Speaking	3
ENGL 314	Technical Communication	3
<b>Total Credits</b>		<b>9</b>

### Social Sciences and Humanities Electives: 12 cr.

<sup>2</sup>

Six of twelve credits must be from 200-level or above courses. Six credits must be sequential or related courses.

### Basic Program: 24 cr.

<sup>3</sup>

**A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.**

CHEM 167	General Chemistry for Engineering Students	4
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
LIB 160	Introduction to College Level Research	1
I E 148	Information Engineering	3
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 17 cr.

MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
STAT 231	Probability and Statistical Inference for Engineers	4
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1
<b>Total Credits</b>		<b>17</b>

### Industrial Engineering Core: 34 cr.

**A minimum GPA of 2.00 required for this set of courses (please note that transfer course grades will not be calculated into the Core GPA):**

I E 222	Design & Analysis Methods for System Improvements	3
I E 248	Engineering System Design, Manufacturing Processes and Specifications	3
I E 271	Applied Ergonomics and Work Design	3
I E 305	Engineering Economic Analysis	3
I E 312	Optimization	3
I E 341	Production Systems	3
I E 348	Solidification Processes	3
I E 361	Statistical Quality Assurance	3
I E 413	Stochastic Modeling, Analysis and Simulation	4
I E 441	Industrial Engineering Design	3
I E 448	Manufacturing Systems Engineering	3
<b>Total Credits</b>		<b>34</b>

### Other Remaining Courses: 26 cr.

<sup>2</sup>

MAT E 273	Principles of Materials Science and Engineering	3
E E 442	Introduction to Circuits and Instruments	2
C E 274	Engineering Statics	3
M E 231	Engineering Thermodynamics I	3
Focus Electives		6
Management Electives		3
Engineering Topic Electives		6
<b>Total Credits</b>		<b>26</b>

### Seminar/Co-op/Internships:

I E 101	Industrial Engineering Profession	R
Optional co-op/internship courses		

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also allowed by the department to meet other course requirements within the degree program.

U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.



- For Social Sciences and Humanities, Focus, Management, and Engineering Topic Electives, choose from the department approved list. (<http://www.imse.iastate.edu/wp-content/blogs.dir/16/files/2011/06/Elective-List-2013-2014-8-12-2013.pdf>)
- See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

See also the following grid showing course template by semester:

#### 4-Year Plan of Study for Industrial Engineering

Industrial Engineering, B.S.

##### First Year

Fall	Credits Spring	Credits
I E 148	3 SSH Elective	3
SSH Elective	3 MATH 166	4
MATH 165	4 ENGL 150	3
CHEM 167	4 I E 101	R
ENGR 101	R LIB 160	1
	PHYS 231	4
	PHYS 231L	1
	<b>14</b>	<b>16</b>

##### Second Year

Fall	Credits Spring	Credits
MATH 265	4 MATH 267	4
I E 248	3 STAT 231	4
MAT E 273	3 I E 222	3
PHYS 232	4 I E 271	3
PHYS 232L	1	
ENGL 250	3	
	<b>18</b>	<b>14</b>

##### Third Year

Fall	Credits Spring	Credits
I E 305	3 ENGR Topic Elective	3
I E 341	3 SSH Elective	3
I E 312	3 I E 348	3
SP CM 212	3 I E 361	3
C E 274	3 E E 442	2
	<b>15</b>	<b>14</b>

##### Fourth Year

Fall	Credits Spring	Credits
Focus Elective	3 Focus Elective	3
SSH Elective	3 Managment Elective	3

I E 413	4 ENGR Topic Elective	3
ENGL 314	3 I E 441	3
M E 231	3 I E 448	3
	<b>16</b>	<b>15</b>

### Engineering Sales Minor

The Engineering Sales Minor is multidisciplinary and open to undergraduates in the College of Engineering. The minor requires 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

I E 450	Technical Sales for Engineers	3
I E 430	Entrepreneurial Product Engineering	3
MKT 340	Principles of Marketing	3
MKT 442	Sales Management	3
or MKT 447	Consumer Behavior	
or MKT 450	Advanced Professional Selling	
And one of the following:		3
I E 305	Engineering Economic Analysis	
FIN 301	Principles of Finance	
C E 206	Engineering Economic Analysis and Professional Issues in Civil Engineering	
<b>Total Credits</b>		<b>15</b>

## Concurrent B.S./Master's Industrial Engineering Degree

If you are considering going to graduate school, the concurrent B.S. IE/Master's program (either M.S. or M.Eng.) in industrial engineering is an excellent opportunity to obtain both degrees within 5 years. Up to 6 credits of graduate course work can be used to satisfy your program requirements for both degrees. After completing the B.S. program, you will be a full-time graduate student for the remainder of the Master's program.

### Program Policies

- Up to two semesters of concurrent enrollment are allowed.
- Students can enroll in up to nine credits of coursework at the 500-level in Industrial Engineering for both the B.S. and M.S./M.Eng. degrees. Six credits will be shared with your undergraduate degree. The remaining three credits will be applied to your M.S. or M.Eng. degree.
- Students must take at least three credits of 500-level courses each semester during concurrent enrollment and will be paying graduate tuition and fees.

- Students participating in the concurrent program must adhere to the requirements for the graduate degree program in which they are enrolled.

## Admission Requirements

Students must have a record of high academic achievement and should have a GPA of at least 3.40 on a 4.00 scale. Students must be within 30 credits of completing the requirements for the B.S. degree before applying to the concurrent program. Prospective students **must** speak with their undergraduate advisor prior to applying.

## Concurrent B.S. in Industrial Engineering and MBA in the College of Business

Accelerate Your Career with an MBA

Today's successful engineers often need strong business management skills to complement their degree in engineering. These skills are especially important for engineers who are interested in working for technical companies, launching their own business ventures, or pursuing nontraditional jobs such as consulting. The MBA provides an opportunity for competitive advantage for advancement into management positions.

The Colleges of Business and Engineering offer an integrated, concurrent program leading to bachelor of science and master of business administration degrees.

The best part is that this program reduces by one year the normal time for completing both degrees separately.

The program is designed to be completed in a minimum of five academic years or ten semesters.

The actual time for completion may be longer depending upon semester course loads, internships, and course sequencing. Careful planning with an academic advisor is essential throughout the program. This program is slightly accelerated through the first six semesters to complete the general education requirements. The remaining four semesters integrate the B.S. in IE requirements and the MBA courses. Twelve credits will be shared in common and will fulfill the requirements for both the B.S. in IE and the MBA.

Summer study is possible, although students are strongly encouraged to complete at least two internships or co-ops in engineering and business for practical experience during their academic program.

## Preparation for the B.S. IE/MBA

Students interested in pursuing the MBA need to demonstrate exemplary academic performance throughout their undergraduate program. Mastery of communications, economic theory, global and diversity perspectives, statistical data analysis, and the core professional curriculum is of particular importance.

## The Selection Process

The program is demanding and admission is selective. Students are expected to exhibit superior intellectual ability, strong leadership attributes, and must be highly motivated and career-focused. Although not absolute minimums, admitted students typically will have earned a cumulative GPA of 3.00 or above and have scored 600 or higher on the Graduate Management Admissions Test (GMAT). All application materials, however, are taken into account collectively in the applicant review and student selection process.

## GRADUATE STUDY

The department offers programs for the degrees Master of Engineering (M.Eng.), Master of Science (M.S.), and Doctor of Philosophy (Ph.D.) with a major in industrial engineering. A minor is available to graduate students having a major in another department. The M.Eng. degree consists of coursework designed to improve professional expertise in industrial engineering. The M.S. and Ph.D. degrees are designed to improve the student's capability to conduct research as well as advancing their professional expertise. In conjunction with the Department of Mechanical Engineering, the department offers a certificate in advanced manufacturing.

The prerequisite to major graduate work is the completion of a curriculum similar to that required of undergraduate students in engineering at this institution. Because of the diversity of industrial engineering topics, it is possible for a student to qualify for graduate study even though undergraduate or prior graduate training has been in a discipline other than engineering; e.g., mathematics or physics. However, completion of a math sequence of calculus through differential equations is expected.

The graduate program offers advanced study in advanced manufacturing, ergonomics/human factors, operations research/analytics, systems engineering and engineering management.

Well-qualified juniors and seniors in industrial engineering who are interested in graduate study may apply for concurrent enrollment to simultaneously pursue both the industrial engineering bachelor's degree and an M.Eng or M.S. degree. Another attractive concurrent degree option is the industrial engineering bachelor's degree concurrent with a Master of Business Administration degree from the business college. For additional information about graduate degree programs, admission criteria, and procedures refer to <https://www.imse.iastate.edu/graduate-program/>.

## Materials Engineering

For the undergraduate curriculum in materials engineering leading to the degree bachelor of science. The Materials Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>. Materials engineering is a broadly-based discipline

relating the composition, structure, and processing of materials to their properties, uses and performance. Materials engineering includes a variety of traditional and modern technologies involving metals, ceramics, polymers, composites, and electronic materials.

Because of its interdisciplinary nature, career opportunities for materials engineers bridge all industrial and government sectors including: advanced manufacturing, materials for energy and power, biomaterials and biomedical technology, functional materials and devices, nanomaterials and coatings, durable goods, infrastructure, and vehicle technologies (automotive, aerospace).

Student Learning Outcomes

Graduates of the Materials Engineering curriculum should have, at the time of graduation:

- 1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
- 2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
- 3. an ability to communicate effectively with a range of audiences
- 4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
- 5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
- 6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- 7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Program Educational Objectives

Within a few years of completing the Materials Engineering degree program, our graduates are expected to:

- *Work*-competently engage in professional employment, applying knowledge and skills related to the structure, properties, processing, and performance of materials.

- *Learn*-invest in broad life-long learning activities, such as advanced academic or professional degree programs, practical training, professional development, and leadership training.
- *Serve*-actively contribute to professional communities in their chosen career paths, including professional societies, advisory boards, standards and regulatory boards, and internal company organizations.

Graduates in materials engineering are able to apply scientific and engineering principles to select or design the best materials to solve engineering problems. They are also able to control the microstructure of materials through processing to optimize properties and performance. They are skilled in creative, independent problem solving under time and resource constraints. Graduates have the opportunity to gain experience in materials engineering practice through cooperative work experience or internships in industry, national laboratories, or other funded research. Graduates can develop a global perspective of engineering through various study abroad opportunities. Classes provide hands-on skills with a broad range of modern materials processing and characterization equipment and methods.

A degree in materials engineering relies on a strong foundation of math, chemistry and physics. The core materials courses include fundamentals of materials, kinetics and thermodynamics, mechanical properties, computational methods, design, and professional practice experience. Students tailor their programs to their goals and interests through the selection of a specialization from the three available: ceramic materials, metallic materials and polymeric materials. Additional technical electives can be taken in other areas of interest. The breadth and depth of the program provide excellent preparation for immediate entry into industry, further study in graduate school, as well as many other unique career paths (i.e. law, military service, art conservation, museum conservatorship, etc).

Curriculum in Materials Engineering

Administered by the Department of Materials Science and Engineering.  
  
Leading to the degree bachelor of science.

**Total credits required: 128 cr. Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

**Communication Proficiency/Library requirement:**

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3

LIB 160	Introduction to College Level Research	1
Complete one of the following courses (Must earn a grade of C or better)		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	

**Advanced Communication Courses: 6 cr.**

ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
Complete one of the following courses (Must earn a grade of C or better)		3
ENGL 314	Technical Communication	
ENGL 309	Proposal and Report Writing	
ENGL 302	Business Communication	

**General Education Electives: 12 cr.**

Complete 12 cr. from approved list with a minimum of 3 cr. from 200+ level courses and maximum of 9 cr from the same designator<sup>2</sup>.

**Basic Program: 24 cr.**<sup>3</sup>

A minimum GPA of 2.00 is required for this set of courses. (Please note that transfer course grades will not be calculated into the Basic Program GPA.) See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 177	General Chemistry I	4
or CHEM 167	General Chemistry for Engineering Students	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
ENGR 160	Engineering Problems with Computer Applications Laboratory <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

**Math and Physical Science: 18 cr.**

CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4

PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1
<b>Total Credits</b>		<b>18</b>

**Materials/Specialties Engineering Core: 47 cr.**

A minimum average GPA of 2.00 is required for this set of courses.

(Please note that transfer course grades will not be calculated into the Core/Specialization GPA.)

MAT E 170	Numeric, Symbolic, and Graphical Methods for Materials Engineering	3
MAT E 214	Structural Characterization of Materials	3
MAT E 215	Introduction to Materials Science and Engineering I	3
MAT E 215L	Introduction to Materials Science and Engineering I - Lab	1
MAT E 216	Introduction to Materials Science and Engineering II	3
MAT E 216L	Introduction to Materials Science and Engineering II - Lab	1
MAT E 311	Thermodynamics in Materials Engineering	3
MAT E 314	Kinetics and Phase Equilibria in Materials	3
MAT E 317	Introduction to Electronic Properties of Ceramic, Metallic, and Polymeric Materials	3
MAT E 319	Mechanics of Structures and Materials	3
MAT E 413	Materials Design and Professional Practice I	3
MAT E 414	Materials Design and Professional Practice II	3
MAT E 418	Mechanical Behavior of Materials	3
Students must choose one from the three areas of specialization (12 cr.): ceramic, metallic or polymeric materials.		12
<b>Total Credits</b>		<b>47</b>

The courses below meet the specialization requirement. Students select one of the following tracks (ceramics, metals, polymers):

**Ceramic Materials:**

MAT E 321	Introduction to Ceramic Science	3
MAT E 322	Introduction to Ceramic Processing	3
MAT E 425	Glass Science and Engineering	3
MAT E 433	Advanced Ceramics and Electronic Materials	3

**Metallic Materials:**

MAT E 341	Metals Processing	3
MAT E 342	Structure/Property Relations in Nonferrous Metals	3
MAT E 443	Physical Metallurgy of Ferrous Alloys	3
MAT E 444	Corrosion and Failure Analysis	3

**Polymeric Materials:**

MAT E 350	Polymers and Polymer Engineering.	3
MAT E 351	Introduction to Polymeric Materials	3
MAT E 453	Physical and Mechanical Properties of Polymers	3
MAT E 454	Polymer Composites and Processing	3

**Other Courses: 21 cr.**

STAT 305	Engineering Statistics	3
In-department electives from list of materials courses <sup>2</sup>		6
Technical electives from approved departments <sup>2</sup>		12
<b>Total Credits</b>		<b>21</b>

**Seminar/Co-op/Internships**

Co-op and internships are optional

MAT E 301	Materials Engineering Professional Planning	R
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1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
2. Choose from department approved list (<https://www.mse.iastate.edu/files/2019/08/UG-HANDBK-2019-2020-revised-08-19-19.pdf>).
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

Note: A Mat E student may take up to 6 credit hours from General Education electives on a P/NP basis, except for courses used to meet the U.S. Diversity and International Perspectives requirements. S/F courses (different from P/NP) will be considered for these requirements on a course-by-course basis.

See also: A 4-year plan of study grid showing course template by semester.

Materials Engineering, B.S.

**First Year**

Fall	Credits Spring	Credits
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 MATH 166	4
ENGR 101	R MAT E 170	3
ENGR 160	3 Gen Ed Elective	3
MATH 165	4 US Diversity	3
LIB 160	1	
<b>16</b>		<b>17</b>

**Second Year**

Fall	Credits Spring	Credits
MATH 265	4 MAT E 301	R
MAT E 215	3 MATH 267	4
MAT E 215L	1 MAT E 214	3
PHYS 231	4 MAT E 216	3
PHYS 231L	1 MAT E 216L	1
ENGL 250	3 PHYS 232	4
	PHYS 232L	1
<b>16</b>		<b>16</b>

**Third Year**

Fall	Credits Spring	Credits
MAT E 311	3 MAT E 314	3
MAT E 317	3 MAT E 319	3
Specialization	3 Specialization	3
Materials Elective	3 STAT 305	3
Technical Elective	3 International Perspective	3
<b>15</b>		<b>15</b>

**Fourth Year**

Fall	Credits Spring	Credits
MAT E 413	3 MAT E 414	3
MAT E 418	3 Specialization	3
Specialization	3 Materials Elective	3
Technical Elective	3 Technical Elective	3
Technical Writing	3 Technical Elective	3
	Gen Ed Elective	3
<b>15</b>		<b>18</b>

**Areas of specialization:**

- Ceramic Materials: 321, 322, 425, 433
- Metallic Materials: 341, 342, 443, 444
- Polymeric Materials: 350, 351, 453, 454

The MSE Department offers concurrent enrollment program opportunities for students wishing to enroll in either the M.S. degree program or the M. Eng. degree program during the final stages of their B.S. program completion. Minimum admission requirements for these concurrent programs are the same as those for the regular M.S. and M. Eng. admission. (See MSE Graduate admission requirements (<https://www.grad-college.iastate.edu/academics/programs/apresresults.php?id=75>)). Concurrently enrolled students are considered graduate students for official enrollment and tuition/fee purposes. MSE students concurrently enrolled as B.S./M.S. students are eligible for Graduate Research Assistantships (GRA), but these require Major Professor

sponsorship and are not guaranteed with admission to the program. Assistantships are not available for B.S./M.Eng. students.

See the Graduate College Handbook for more details concerning application procedures. Undergraduate students should visit with both their academic advisor and the MSE Director of Graduate Education to discuss interest in a concurrent program, learn more about blending the undergraduate and graduate curricula, and to obtain copies of the application forms.

- **Eligibility** – Undergraduate students who will have earned 90 credits toward the BS Mat E degree by the time of concurrent enrollment are eligible to apply for a concurrent program.
- **Application Process** – Applications for concurrent enrollment are not submitted through the Graduate College online application system. Rather, completed (paper) application packages should be submitted directly to the MSE Graduate Program Coordinator.
- **Applications are accepted anytime.**
- **Application Package** – The application package must include the following materials:
  - The ISU Concurrent Enrollment application form (“Concurrent Enrollment for Undergraduate Student Wishing to Pursue a Graduate Certificate or Degree”).
  - MSE Concurrent Enrollment Request form
  - Resume/CV
  - Three letters of recommendation

The MSE Department also offers a B.S. MAT E and MBA concurrent enrollment program in collaboration with the Ivy College of Business. For more information about this program, please visit: <https://www.ivybusiness.iastate.edu/full-time-concurrent-mba/>.

## Materials Science and Engineering Graduate Studies

The Materials Science and Engineering Department offers three graduate degree programs representing a range of opportunities for advanced study. While they share several common features, the programs are designed to serve students with a variety of academic backgrounds, technical interests, and career aspirations. In all three programs, it is expected that our graduate students will acquire fundamental understanding of the structure, properties, processing, and performance of materials, underpinned by the foundational pillars of thermodynamics and kinetics and manifested by the immense landscape of engineered materials and the broad range of physical, chemical, and mechanical functionalities that may be realized in them. Our degree programs include a combination of classroom instruction, seminars, laboratory training, guided teaching experiences, individually mentored independent study, and various forms of materials research experiences, all intended to

serve students with a wide range of educational goals. Students are admitted with undergraduate or prior graduate qualifications in a variety of technical areas, and each program of study is tailored to meet the needs of the individual student. The accomplishments of our alumni demonstrate that our graduate training enables a wide range of career paths, but certain types of technical employment opportunities are targeted by the specific components within each degree program, as summarized below.

The Master of Engineering (M. Eng.) program in Materials Science and Engineering is a coursework-only degree program intended to provide broad knowledge related to materials processing, structure, properties, and performance, coupled with an understanding of the various materials challenges associated with existing and emerging technologies and industry/business sectors. The program is delivered mainly through classroom-based instruction but may also include laboratory-based courses and/or online courses. The curriculum combines a core of fundamental coursework with a highly flexible set of electives, which may include MSE courses and courses from other fields of study. This flexible coursework-only degree option is intended to provide advanced knowledge of fundamental and contemporary issues in Materials Science and Engineering relevant to a broad range of career paths.

The Master of Science (M.S.) program in Materials Science and Engineering is an intensive advanced degree program combining graduate coursework and project-based research. The program is intended to provide broad-based knowledge related to materials processing, structure, properties, and performance, coupled with an understanding of the various materials challenges associated with existing and emerging technologies and industry sectors. The program is delivered mainly through classroom-based instruction but may also include laboratory-based courses and/or online courses. The curriculum combines a core of fundamental coursework and a complement of MSE and non-MSE electives.

Two program options are available, and students enrolled in the MS degree program will select either the *Research Thesis* track or the *Research Portfolio* track. Both tracks include a substantial research component but with different focus.

- The *Research Thesis* track provides an opportunity for the student to complete a full-scale research project from beginning to end, including literature review, project design, planning, laboratory and/or computational investigation, data analysis, decision-making, formulation of conclusions, and appropriate reporting of outcomes. The research, culminating in a thesis document, will be conducted under the supervision of a major professor. In this track, the research efforts are aimed at making an identifiable contribution toward solving a relevant problem in a selected area of science and/or engineering. Project success is judged on the scientific soundness



of the contribution and the quality with which it is presented in the Thesis document and in a final oral presentation/examination.

- The *Research Portfolio* track provides an opportunity for the student to complete several separate research projects involving multiple selected topics and methods of experimental and/or computational investigation in accordance with the student's interests. In this track, research is conducted through a sequence of three 3-credit project-based courses, each supervised by a specific faculty member and focused on a different area of research and related methods and analysis techniques. Each project has specific scientific objectives, but the focus of the overall portfolio is for the student to develop expertise in a targeted set of laboratory and/or computational research skills. Assessment is based on practical examinations and documented research results associated with each project. The program also requires a comprehensive presentation and oral examination covering all of the student's project work. Each student's overall program is overseen by a major professor.

The Doctor of Philosophy (Ph.D.) degree is the highest academic credential in the field. ISU's robust multi-faceted program is intended to develop state-of-the-art competencies in academic scholarship, enabling graduates to make high-level career-based contributions in fields related to Materials Science and Engineering. The Ph.D. program combines graduate coursework with intensive and specialized project-based research expected to result in significant reportable scientific contributions in one or more selected areas, as evidenced by publication in peer-reviewed journals, industry standards, patents, or other forms of recognizable technical contributions.

The MSE department boasts excellent facilities for academic materials research, maintaining a wide range of faculty laboratories across the ISU campus. In addition, departmental research is highly integrated with the operation of several Research Centers, such as the Ames Laboratory, the Center for Nondestructive Evaluation, the Microelectronics Research Center, the Center for Advanced Nonferrous Structural Materials, the Caloric Materials Consortium, the Critical Materials Institute, and the Sensitive Instruments Facility. These laboratories provide excellent resources for our graduate students in advanced materials research.

## Graduate Majors

The Materials Science and Engineering Department offers three graduate degree programs:

- *Master of Engineering* in Materials Science and Engineering
- *Master of Science* in Materials Science and Engineering
- *Doctor of Philosophy* in Materials Science and Engineering

**Eligibility:** Enrollment in a graduate degree program requires prior\* completion of an undergraduate curriculum in Materials Science

and Engineering or any discipline of engineering, physical science, or biological science. Graduate students from disciplines other than materials science and engineering may expect that supplemental coursework will be needed, in addition to the required graduate coursework.

**Requirements:** Program requirements include:

- Required core and elective coursework
- Research (M.S. and Ph.D. only)
- Research proposal (M.S. and Ph.D. only)
- Qualifying examination (Ph.D. only)
- Preliminary oral examination (Ph.D. only)
- Thesis/dissertation (M.S. and Ph.D. only)
- Final oral examination (M.S. and Ph.D. only)

Specific requirements for each degree program are specified in the MSE Graduate Handbook and Graduate College Handbook.

**Minor:** The MSE Department offers a graduate minor in Materials Science and Engineering. The graduate minor requires 12 credits of MSE graduate coursework, including 6 credits selected from M S E 510, M S E 520, M S E 530, and M S E 540. In addition, the minor program requires that the POS committee includes at least one member of the MSE Graduate Faculty.

\* Qualified students enrolled in the undergraduate materials engineering program at Iowa State University are eligible to apply to the Graduate College for admission to the concurrent enrollment program, where students may simultaneously pursue undergraduate and graduate degrees.

**Courses primarily for graduate students, open to qualified undergraduates:**

**M S E 501: Fundamentals of Materials Science and Engineering I**  
(1-0) Cr. 1. F.

An examination of structure-property-process relationships in materials, focusing on control and measurement of end-use performance characteristics. Materials design fundamentals are discussed as they pertain to various critical industries, applications, and manufacturing technologies. Offered on a satisfactory-fail basis only.

**M S E 502: Fundamentals of Materials Science and Engineering II**

(1-0) Cr. 1. Repeatable, maximum of 1 credits. S.

*Prereq: M S E 501*

An examination of the physical behavior of materials, as underpinned by multiphase multicomponent thermodynamics, transport phenomena, interfaces, defect structures, the kinetics of phase transformations, and the mechanistic origins of structure-property-processing relationships in various types of materials. Offered on a satisfactory-fail basis only.

**M S E 503: Fundamentals of Materials Science and Engineering III**

(1-0) Cr. 1. SS.

*Prereq: M S E 501, M S E 502 and enrollment in the M S E Ph.D. program*

Directed study of advanced topics in Materials Science and Engineering. Fundamental principles and relationships connecting structure, chemistry, stability, physical behavior, properties, and processing response are reviewed. Experimental and computational methods for materials research are emphasized. Offered on a satisfactory-fail basis only.

**M S E 510: Fundamentals of Structure and Chemistry of Materials**

(3-0) Cr. 3. F.

*Prereq: MATH 165, PHYS 221, and CHEM 167*

Geometric and algebraic representations of symmetry. Pair distribution function. Structure, chemistry, and basic properties of covalent, ionic, and metallic solids, glasses and liquids, and polymers. Interactions of materials with particles and waves. Relationships between direct and reciprocal spaces. The kinematical theory of diffraction, with an introduction to the dynamical theory.

**M S E 519: Magnetism and Magnetic Materials**

(Dual-listed with MAT E 419). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E E 311 or MAT E 317 or PHYS 364*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, magnetic measurements of properties for materials evaluation.

**M S E 520: Thermodynamics and Kinetics in Multicomponent Materials**

(3-0) Cr. 3. F.

*Prereq: MAT E 311 or CHEM 321, MATH 266 or MATH 267*

A review of the fundamental principles of heat, work, basic thermodynamic relations, and criteria for equilibrium. Analytical treatments for the thermodynamic description of multicomponent chemical solutions and reacting systems are developed and employed to predict phase equilibria in materials systems. Builds on the thermodynamic construction to treat the kinetics of chemical reactions and phase transformations. Topics include general first order and second order transitions, along with chemical diffusion. Detailed examples involving nucleation and diffusion limited growth, spinodal decomposition, martensitic transformations, magnetic and electric transitions, and glass formation will be considered.

**M S E 521: Mechanical Behavior and Manufacturing of Polymers and Composites**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: M E 324, E M 324*

Effect of chemical structure and morphology on properties. Linear viscoelasticity, damping and stress relaxation phenomena. Structure and mechanics of filler and fiber reinforced composites. Mechanical properties and failure mechanisms. Material selection and designing with polymers. Processing of polymer and composite parts.

**M S E 530: Solid State Science**

(3-0) Cr. 3. S.

*Prereq: MAT E 334 or E E 332 or PHYS 322*

Development of a quantitative description of the electronic structure of solids starting with fundamentals of atoms, atomic bonding, basic crystallography, and band theory of solids. Continuum properties of solids in response to electromagnetic fields and thermal gradients. Quantitative description of the atomistic properties of solids through electron-electron interactions, electron-phonon interactions, and dipole interactions.

**M S E 532: Microelectronics Fabrication Techniques**

(Dual-listed with MAT E 432). (Cross-listed with E E). (2-4) Cr. 4.

*Prereq: CPR E and E E majors: E E 230; MAT E majors: MAT E 317*

Techniques used in modern integrated circuit fabrication, including diffusion, oxidation, ion implantation, lithography, evaporation, sputtering, chemical-vapor deposition, and etching. Process integration. Process evaluation and final device testing. Extensive laboratory exercises utilizing fabrication methods to build electronic devices. Use of computer simulation tools for predicting processing outcomes. Recent advances in processing CMOS ICs and micro-electro-mechanical systems (MEMS).

**M S E 537: Electronic Properties of Materials**

(Dual-listed with MAT E 437). (Cross-listed with E E). Cr. 3. S.

*Prereq: E E 332 or MAT E 317 or PHYS 322*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, biomedical applications of magnetism, magnetic evaluation of materials.

**M S E 540: Mechanical Behavior of Materials**

(3-0) Cr. 3. S.

*Prereq: MAT E 418, MATH 266 or MATH 267*

Mechanical behavior of materials with emphasis on micromechanics of deformation in three generic regimes: elasticity, plasticity, and fracture. A materials science approach is followed to understand and model the mechanical behavior that combines continuum mechanics, thermodynamics, kinetics, and microstructure. Some topics include elastic properties of materials, permanent deformation mechanisms at different temperatures (e.g., via dislocation motion and creep), and fracture in ductile and brittle materials. Specific classes of materials that are studied: metals, ceramics, polymers, glasses and composites.

**M S E 550: Nondestructive Evaluation**

(Cross-listed with E M). (3-2) Cr. 4. S.

*Prereq: E M 324, MATH 385*

Principles of five basic NDE methods and their application in engineering inspections. Materials behavior and simple failure analysis. NDE reliability, and damage-tolerant design. Advanced methods such as acoustic microscopy, laser ultrasonics, thermal waves, and computed tomography are analyzed. Computer-based experiments on a selection of methods: ultrasonics, eddy currents, x-rays are assigned for student completion.

**M S E 551: Characterization Methods in Materials Science**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MAT E 214*

Characterization of ceramic, metal, polymer and glassy materials using modern analytical techniques. Spectroscopic (IR, Raman, UV/VIS/NIR, and NMR), thermal (DSC, DTA/TGA, and DMA) methods, mechanical and rheological testing, magnetic and electrical characterization, and powder characterization.

**M S E 552: Scanning and Auger Electron Microscopy**

(Dual-listed with MAT E 452). (2-3) Cr. 3. F.

*Prereq: PHYS 232*

Characterization of materials using scanning electron microscope (SEM), electron microprobe, and auger spectrometer. Compositional determination using energy and wavelength dispersive x-ray and Auger spectroscopies. Specimen preparation. Laboratory covers SEM operation.

**M S E 553: Physical and Mechanical Properties of Polymers**

(Dual-listed with MAT E 453). (2-3) Cr. 3. F.

*Prereq: MAT E 351*

Overview of polymer chemical composition, microstructure, thermal and mechanical properties, rheology, and principles of polymer materials selection. Intensive laboratory experiments include chemical composition studies, microstructural characterization, thermal analysis, and mechanical testing.

**M S E 554: Polymer Composites and Processing**

(Dual-listed with MAT E 454). (3-0) Cr. 3. S.

*Prereq: MAT E 351*

Basic concepts in polymer composites, blends, and block copolymers. Phase separation and miscibility, microstructures and mechanical behavior. Fiber reinforced and laminated composites. Viscosity, rheology, viscoelasticity of polymers. Polymer melt processing methods such as injection molding and extrusion; selection of suitable processing methods and their applications.

**M S E 556: Biomaterials**

(Dual-listed with MAT E 456). (3-0) Cr. 3. F.

*Prereq: CHEM 178; (MAT E 216 or MAT E 273 or MAT E 392)*

Presentation of the basic chemical and physical properties of biomaterials, including metals, ceramics, and polymers, as they are related to their manipulation by the engineer for incorporation into living systems. Role of microstructure properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

**M S E 557: Chemical and Physical Metallurgy of Rare Earth Metals**

(Dual-listed with MAT E 457). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: CHEM 325 or MAT E 311*

Electronic configuration, valence states, minerals, ores, beneficiation, extraction, separation, metal preparation and purification. Crystal structures, phase transformations and polymorphism, and thermochemical properties of rare earth metals. Chemical properties: inorganic and organometallic compounds, alloy chemistry, nature of the chemical bonding. Physical properties: mechanical and elastic properties, magnetic properties, resistivity, and superconductivity.

**M S E 564: Fracture and Fatigue**

(Cross-listed with AER E, E M, M E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.

*Undergraduates:* Permission of instructor

Materials and mechanics approach to fracture and fatigue.

Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**M S E 569: Mechanics of Composite and Combined Materials**

(Cross-listed with AER E, E M). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* E M 324

Mechanics of fiber-reinforced materials. Micromechanics of lamina. Macromechanical behavior of lamina and laminates. Strength and interlaminar stresses of laminates. Failure criteria. Stress analysis of laminates. Thermal moisture and residual stresses. Joints in composites.

**M S E 581: Computational Modeling of Materials**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* (MATH 265 and MAT E 311) or CHE 381 or CHEM 325 or PHYS 304

Introduction to the basic methods used in the computational modeling and simulation of materials, from atomistic simulations to methods at the mesoscale. Students will be expected to develop and run sample programs. Topics to be covered include, for example, electronic structure calculations, molecular dynamics, Monte Carlo, phase-field methods, etc.

**M S E 588: Eddy Current Nondestructive Evaluation**

(Dual-listed with MAT E 488). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* MATH 265 and (MAT E 216 or MAT E 273 or MAT E 392 or E E 311 or PHYS 364)

Electromagnetic fields of various eddy current probes. Probe field interaction with conductors, cracks and other material defects. Ferromagnetic materials. Layered conductors. Elementary inversion of probe signals to characterize defects. Special techniques including remote-field, transient, potential drop nondestructive evaluation and the use of Hall sensors. Practical assignments using a 'virtual' eddy current instrument will demonstrate key concepts.

**M S E 590: Special Topics**

Cr. arr. Repeatable.

*Prereq:* Permission of instructor

**M S E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**M S E 601: Materials Seminar**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq:* MSE Graduate Student Status

Seminar course - presentations given on a weekly basis by leading U.S. and International researchers that are experts in their respective fields closely related to Materials Science. Offered on a satisfactory-fail basis only.

**M S E 620: Fundamentals of Phase Transformations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* M S E 520

Explores various advanced theoretical treatments of the energetics and kinetics of multicomponent materials. Topics include analytical and computational descriptions of thermodynamic quantities, experimental measurement of essential physical properties, analytical and computational treatments of kinetic processes, and the use of theoretical predictions of phase equilibria and evolution in materials systems.

**M S E 630: Physical Properties of Solids**

(3-0) Cr. 3.

*Prereq:* M S E 530

Advanced course in the behavior of solids within the framework of solid state physics and chemistry. Includes magnetic, dielectric, transport, and optical phenomena in solids. Influence of phase transformations and crystal symmetry on the physical properties.

**M S E 651: Powder Diffraction Methods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* M S E 510

Advanced structural characterization of materials using powder diffraction. Production of X-ray and neutron radiation. Review of symmetry, group and kinematical theories of diffraction. Mathematical and computational backgrounds of powder diffraction data. Introduction to single crystal diffraction methods, origin of powder diffraction pattern, history of the technique. Modern powder diffraction methods. Indexing of powder diffraction patterns, figures of merit, precise lattice parameters. Phase problem, determining crystal structures from symmetry and geometry, Patterson, direct and Fourier methods. Rietveld method, precise crystal structures: atomic parameters, qualitative and quantitative phase identification, preferred orientation, grain size, strain, residual stress, order-disorder. Powder diffraction at non-ambient conditions. Applications of powder diffraction: data bases, phase transformations, phase diagrams, local structures, magnetism.

**M S E 652: Transmission Electron Microscopy**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: M S E 510*

Theory and application of transmission electron microscopy to inorganic materials. Specimen preparation, selected area and convergent beam electron diffraction, bright field/dark field/high resolution imaging. Compositional analysis using X-ray and electron energy loss spectroscopy.

**M S E 690: Advanced Topics in Materials Science**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**M S E 697: Engineering Internship**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of department, graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**M S E 699: Research**

Cr. arr. Repeatable.

## Mechanical Engineering

For the undergraduate curriculum in mechanical engineering leading to the degree bachelor of science. The Mechanical Engineering program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org/>.

Mechanical engineers apply the principles of motion, energy, and force to create mechanical solutions to technological problems, thereby realizing devices and systems that make life better. About one-fifth of all engineers practicing today are mechanical engineers. Their skills are used in research, development, design, testing, production, technical sales, technical management, as well as medicine, law, and business. Mechanical engineers are characterized by personal creativity, breadth of knowledge, and versatility. For these reasons they are found to function and thrive as valuable members and leaders of multidisciplinary teams. Mechanical engineers are employed in a wide range of industries; examples include agricultural/heavy equipment, biomedical, consulting, energy and power, manufacturing, product design and transportation.

### Student Learning Outcomes:

Graduates of the Mechanical Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety,

and welfare, as well as global, cultural, social, environmental, and economic factors

3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

### Program Educational Objectives:

The mechanical engineering curriculum is organized to provide students with a broad foundation in mathematics, science, engineering, social science and humanities. Areas emphasized in the curriculum are design and optimization, dynamic systems and control, materials processing and mechanics, and thermo-fluid sciences. Elective courses provide additional emphasis in terms of the student's unique educational goals, whether they include immediate entry into industry or further professional or graduate study.

The mechanical engineering curriculum at Iowa State University is dedicated to preparing students for productive careers in the state, nation, and the world and has the following objectives:

1. Graduates will have utilized a foundation in engineering and science to improve lives and livelihoods through a successful career in mechanical engineering or other fields.
2. Graduates will have become effective collaborators and innovators, leading or participating in efforts to address social, technical and business challenges.
3. Graduates will have engaged in life-long learning and professional development through self-study, continuing education or graduate and professional studies in engineering, business, law or medicine.

A major focus throughout the mechanical engineering curriculum is a series of experiences that emphasize engineering design, culminating in a capstone design experience in the senior year. Students will develop engineering judgment through open-ended problems that require establishment of reasonable engineering assumptions and realistic constraints. Development of skills needed to be independent, creative thinkers, effective communicators, and contributing team members is integrated throughout the curriculum. Students also develop an understanding of the societal context in which they will practice



engineering, including environmental, legal, aesthetic, and human aspects.

Students are encouraged to participate in the cooperative education program or to obtain engineering internships, both domestically and abroad. Study abroad is encouraged, and the department has exchange programs with several universities around the world. These experiences help students to round out their education and to better prepare for careers in the increasingly global practice of engineering.

## Curriculum in Mechanical Engineering

Administered by the Department of Mechanical Engineering. Leading to the degree bachelor of science.

### Total credits required: 129 cr.

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Basic Program GPA or Core GPA). See also Basic Program and Special Programs.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

### Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
LIB 160	Introduction to College Level Research	1
Choose one of the following communication courses (minimum grade of C)		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
SP CM 212	Fundamentals of Public Speaking	

### General Education Electives: 15 cr.

No more than three 100-level courses for this set of courses can be applied to the Bachelor of Science Degree in Mechanical Engineering.

Choose one course from the following:		3
ECON 101	Principles of Microeconomics	
	or ECON 102 Principles of Macroeconomics	
Social Science		3
Humanities		6
Humanities or Social Science		3
<b>Total Credits</b>		<b>15</b>

### Basic Program: 24 cr.

A minimum GPA of 2.00 is required for this set of courses (please note that transfer course grades will not be calculated into the Basic Program

GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (Must have a C or better in this course)	3
ENGR 101	Engineering Orientation	R
M E 160	Mechanical Engineering Problem Solving with Computer Applications <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Mechanical Engineering Foundations: 25 cr.

A minimum GPA of 2.00 for the complete group of Foundations courses is required before students are permitted to enroll in the following Mechanical Engineering Core courses (please note that transfer course grades will not be calculated into the ME Foundations GPA): ME 324, ME 325, ME 332, ME 335, ME 370 and ME 421.

MATH 265	Calculus III	4
4 credits from the following:		4
MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 266	Elementary Differential Equations and Laplace Transforms	
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1
E M 324	Mechanics of Materials	3
MAT E 273	Principles of Materials Science and Engineering	3
M E 231	Engineering Thermodynamics I	3
C E 274	Engineering Statics	3
<b>Total Credits</b>		<b>25</b>

### Mechanical Engineering Core: 38 cr.

A minimum GPA of 2.00 is required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Core GPA):

M E 345	Engineering Dynamics	3
E E 442	Introduction to Circuits and Instruments	2
E E 448	Introduction to AC Circuits and Motors	2
M E 270	Introduction to Mechanical Engineering Design	3



M E 324	Manufacturing Engineering	3
M E 324L	Manufacturing Engineering Laboratory	1
M E 325	Mechanical Component Design	3
M E 332	Engineering Thermodynamics II	3
M E 335	Fluid Flow	4
M E 370	Engineering Measurements	3
M E 421	System Dynamics and Control	4
M E 436	Heat Transfer	4
One Senior Capstone Design course from the following		3
M E 415	Mechanical Systems Design	
M E 442	Heating and Air Conditioning Design	
<b>Total Credits</b>		<b>38</b>

**Other Remaining Courses: 27 cr.**

Complete 15 cr. Technical Electives <sup>2</sup>		15
M E 170	Engineering Graphics and Introductory Design	3
M E 202	Mechanical Engineering - Professional Planning	R
ENGL 250	Written, Oral, Visual, and Electronic Composition (Must have a C or better in this course)	3
STAT 305	Engineering Statistics	3
Complete one of the following communication courses with a minimum grade of C.		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>27</b>

**Co-op/Internships (Optional)**

- These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program.  
U.S. diversity and international perspectives courses may not be taken Pass/Not Pass.
- Choose from department approved list of technical electives (<http://www.me.iastate.edu/students/degrees-and-programs/bs-degree/degree-requirements/tech-electives/>) and general education electives (<http://www.me.iastate.edu/students/degrees-and-programs/bs-degree/degree-requirements/general-education/>). Note: electives used to meet graduation requirements may not be taken Pass-Not Pass (P-NP).
- See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Basic Program.

**Transfer Credit Requirements**

The Mechanical Engineering Department requires a grade of a C or better for any transfer credit course that is applied to the degree program.

The degree program must include a minimum of 15 credits taken from courses offered through the Mechanical Engineering Department at Iowa State University. Of these 15 credits, 3 must be from one of the senior capstone design courses. The remaining 12 credits may be from the core curriculum program (if a student is deficient in these courses) or from 400-level M E technical electives. No more than 3 credits of independent study shall be applied to meet the 12 credit requirement.

See also: A 4-year plan of study grid showing course template by semester.

Mechanical Engineering, B.S.

**First Year**

Fall	Credits Spring	Credits
CHEM 167	4 ENGL 150	3
M E 160	3 M E 170	3
MATH 165	4 MATH 166	4
ENGR 101	R LIB 160	1
General Education Elective	3 PHYS 231	4
	PHYS 231L	1
<b>14</b>		<b>16</b>

**Second Year**

Fall	Credits Spring	Credits
C E 274	3 E M 324	3
MAT E 273	3 MATH 267	4
MATH 265	4 M E 231	3
PHYS 232	4 M E 270	3
PHYS 232L	1 General Education Elective	3
ENGL 250	3 M E 202	R
<b>18</b>		<b>16</b>

**Third Year**

Fall	Credits Spring	Credits
E E 442	2 M E 325	3
E E 448	2 M E 335	4
M E 345	3 M E 370	3
M E 332	3 M E 324	3
STAT 305	3 Communication Requirement	3
M E 324L	1	
General Education Elective	3	
<b>17</b>		<b>16</b>

**Fourth Year**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Gen Ed Elective (Intl Perspective)	3 Gen Ed Elective (US Diversity)	3
M E 421	4 Technical Elective	3
M E 436	4 Technical Elective	3
Technical Elective	3 Technical Elective	3
Technical Elective	3 Capstone Design	3
<b>17</b>		<b>15</b>

**Energy Systems Minor**

The Energy Systems minor is administered by the mechanical engineering department and is open to all undergraduates in the College of Engineering. The minor may be earned by completing 15 credits from the following courses. The complete list of approved elective courses can be found below. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

<http://www.me.iastate.edu/energy-systems-minor/>

**Required courses**

ECON 380	Energy, Environmental and Resource Economics	3
E E 351	Analysis of Energy Systems	3
or M E 433	Alternative Energy	
Electives: Choose from a list of approved courses		9
<b>Total Credits</b>		<b>15</b>

**Approved Elective Courses**

A B E 325	Biorenewable Systems	3
A B E 342	Agricultural Tractor Power	3
A B E 363	Agri-Industrial Applications of Electric Power and Electronics	4
A B E 380	Principles of Biological Systems Engineering	3
A B E 413	Fluid Power Engineering	3
A B E 472	Controlled Environments for Animals and Plants	3
A B E 480	Engineering Analysis of Biological Systems	3
A B E 572	Controlled Environments for Animals and Plants	3
A B E 580	Engineering Analysis of Biological Systems	3
AER E 381	Introduction to Wind Energy	3
AER E 570	Wind Engineering	3
CH E 356	Transport Phenomena I	3
CH E 357	Transport Phenomena II	3
CH E 358	Separations	3
CH E 381	Chemical Engineering Thermodynamics	3
CH E 382	Chemical Reaction Engineering	3

CH E 415	Biochemical Engineering	3
CH E 515	Biochemical Engineering	3
CH E 554	Integrated Transport Phenomena	4
CH E 583	Advanced Thermodynamics	3
CH E 587	Advanced Chemical Reactor Design	3
CON E 352	Mechanical Systems in Buildings	3
CON E 353	Electrical Systems in Buildings	3
CON E 354	Building Energy Performance	3
E E 303	Energy Systems and Power Electronics	3
E E 448	Introduction to AC Circuits and Motors	2
E E 452	Electrical Machines and Power Electronic Drives	3
E E 455	Introduction to Energy Distribution Systems	3
E E 456	Power System Analysis I	3
E E 457	Power System Analysis II	3
E E 458	Economic Systems for Electric Power Planning	3
E E 459	Electromechanical Wind Energy Conversion and Grid Integration	3
E E 552	Energy System Planning	3
E E 553	Steady State Analysis	3
E E 554	Power System Dynamics	3
E E 555	Advanced Energy Distribution Systems	3
E E 556	Power Electronic Systems	3
E E 559	Electromechanical Wind Energy Conversion and Grid Integration	3
E M 570	Wind Engineering	3
ENSCI 480	Engineering Analysis of Biological Systems	3
M E 332	Engineering Thermodynamics II	3
M E 335	Fluid Flow	4
M E 413	Fluid Power Engineering	3
M E 436	Heat Transfer	4
M E 437	Introduction to Combustion Engineering	3
M E 441	Fundamentals of Heating, Ventilating, and Air Conditioning	3
M E 442	Heating and Air Conditioning Design	3
M E 444	Elements and Performance of Power Plants	3
M E 448	Fluid Dynamics of Turbomachinery	3
M E 449	Internal Combustion Engines	3
M E 501	Fundamentals of Biorenewable Resources	3
M E 530	Advanced Thermodynamics	3
M E 532	Compressible Fluid Flow	3
M E 535	Thermochemical Processing of Biomass	3
M E 536	Advanced Heat Transfer	3
M E 538	Advanced Fluid Flow	3

M E 542	Advanced Combustion	3
M E 545	Thermal Systems Design	3
M S E 520	Thermodynamics and Kinetics in Multicomponent Materials	3
MAT E 311	Thermodynamics in Materials Engineering	3
WESEP 501	Wind Energy Resources	3
WESEP 502	Wind Energy Systems	3

## Concurrent Mechanical Engineering BS/MS Degree

The Department of Mechanical Engineering (ME) provides BS/MS concurrent degrees that allow well-qualified students to be admitted to the graduate program while still working on their undergraduate degrees during their senior year. Concurrent degrees allow well-qualified students to begin their graduate studies before completing their undergraduate degree to complete their graduate degree on an accelerated timeline. Students in concurrent status must be making good progress toward a bachelor's degree. The minimum requirements for admission to concurrent-student status are the same as those required for admission to the Graduate College. Other aspects of concurrent status include:

- Official enrollment and fee payment will be as a graduate student.
- The graduate credential will be awarded at the same time or after the undergraduate degree is conferred.
- Students may be appointed to graduate research assistantships.
- With the approval of a student's Program of Study (POS) Committee, up to 6 ISU credits taken while in concurrent status may be applied to a bachelor's degree and a graduate degree.

Details on the Masters degree requirements and graduate admission in mechanical engineering may be found at: <https://www.me.iastate.edu/graduate-admissions/>

Details on the graduate college policies on concurrent degrees may be found at: <https://www.grad-college.iastate.edu/handbook/chapter.php?id=4#4.3>

## Graduate Study

The department offers programs for the degrees Master of Engineering (M. Eng.), Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) with a major in mechanical engineering. The M.Eng. degree is a coursework-only degree designed to improve professional expertise in mechanical engineering. The M.S. and Ph.D. degrees are designed to improve the student's capability to conduct research as well as their professional expertise. Although co-major and formal minor programs are not offered in mechanical engineering, courses may be used for minor work by students taking major work in other departments.

Well-qualified juniors and seniors in mechanical engineering who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both the Bachelor of Science and Master of Science, the Bachelor of Science and Master of Business Administration. Under concurrent enrollment, students are eligible for assistantships and simultaneously take undergraduate and graduate courses. Details are available in the Graduate Programs Office and on the department's website (<http://www.me.iastate.edu/>).

The graduate program offers advanced study in a variety of thrust areas, including biological and nanoscale sciences, clean energy technologies, complex fluid systems, design and manufacturing innovation, and simulation and visualization.

The department offers students the opportunity to broaden their education by participating in minor programs in established departments, interdepartmental programs, or other experiences as approved by their program of study committees.

The requirements for advanced degrees are established by the student's program of study committee within established guidelines of the Graduate College. Graduate students who have not completed an undergraduate program of study substantially equivalent to that required of undergraduate students in the department can expect that additional supporting coursework will be required.

Program requirements can be found on the department webpage (<http://www.me.iastate.edu/>) and in the Mechanical Engineering Graduate Student Handbook.

## Non-destructive Evaluation Minor

Minor supervised by an interdisciplinary faculty committee, administered by Materials Science and Engineering. The NDE minor is a unique opportunity for engineering students to acquire a multidisciplinary engineering qualification in the rapidly evolving field of Nondestructive Evaluation.

## Undergraduate Study

Students interested in completing the NDE engineering minor must be enrolled in the College of Engineering at Iowa State University. They must submit a "Curriculum Change" form and complete the minimum prescribed 16 credit-hours of course work defined below. Acceptance is based on approval by the administering department, Materials Science and Engineering.

A combined average grade of C or higher is required in courses applied to the minor. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

The course requirements for the undergraduate minor in NDE are:

MAT E/E M 362	Principles of Nondestructive Testing	3
MAT E/E M 362L	Nondestructive Testing Laboratory	1
At least one of the following NDE specific courses		3-4

C E 449	Structural Health Monitoring
E M 480	Ultrasonic Nondestructive Evaluation
MAT E 485X	Penetrating Radiation Methods in Nondestructive Evaluation
MAT E 488	Eddy Current Nondestructive Evaluation
M S E/E M 550	Nondestructive Evaluation

Independent Study courses on NDE projects from other engineering disciplines will need to be approved by the NDE Minor Coordinator

AER E 490J	Aerospace Engineering Independent Study: Non-destructive Evaluation (Research Topic related to NDE for any 490)
or E E 490	Independent Study
or M E 490	Independent Study
or MAT E 490	Independent Study

Up to three of the following or additional NDE specific courses from the list above 9-12

AER E 321	Flight Structures Analysis
AER E 421	Advanced Flight Structures
AER E 422	Vibrations and Aeroelasticity
AER E 423	Composite Flight Structures
AER E 426	Design of Aerospace Structures
CPR E 418	High Speed System Engineering Measurement and Testing
E E 224	Signals and Systems I
E E 418	High Speed System Engineering Measurement and Testing
E M 424	Intermediate Mechanics of Materials
E M 425	Introduction to the Finite Element Method
I E 348	Solidification Processes
I E 361	Statistical Quality Assurance
M E 417	Advanced Machine Design
M E 418	Mechanical Considerations in Robotics
MAT E 418	Mechanical Behavior of Materials
MAT E 443	Physical Metallurgy of Ferrous Alloys
MAT E 444	Corrosion and Failure Analysis
STAT 231	Probability and Statistical Inference for Engineers
STAT 305	Engineering Statistics
STAT 322	Probabilistic Methods for Electrical Engineers

**Total Credits**

**16-20**

## Software Engineering

Administered by the College of Engineering and the College of Liberal Arts and Sciences.

For the undergraduate curriculum in Software Engineering (<http://www.se.iastate.edu>) leading to the degree Bachelor of Science. The Software Engineering Program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

A software engineer uses their expertise to design, develop, and evaluate software, configure and install computer systems, and build and maintain software systems throughout their lifecycle. Specific tasks software engineers perform evolve quickly, reflecting changes in technology, as well as the needs of employers. Software engineers work as members of teams that may include experts in engineering, marketing, manufacturing, accounting, training, and design.

The Software Engineering Program provides undergraduate students with the opportunity to learn Software Engineering fundamentals, to study applications of state-of-the art software technologies, and to prepare for the practice of Software Engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research, and outreach programs.

## Student learning outcomes

Graduates of the Software Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions

7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## PROGRAM EDUCATIONAL Objectives

Within five years of graduation, the graduates should:

1. attain a **productive career** in Software Engineering or related fields;
2. attain **leadership** roles and become **effective collaborators** to advance professional and organizational goals;
3. engage in **lifelong learning** and professional development;
4. encourage and support **diversity** and **inclusiveness** in their workplace.

We expect that these objectives will be manifested in our graduates through the following five key attributes: (a) *peer-recognized expertise*, (b) *engagement in professional practice*, (c) *sustained learning*, (d) *leadership* and (e) *teamwork*.

Demonstration of expertise involves applying state-of-the-art practices for solving problems in the design, development, validation, evolution and sustainment of (software) products. Demonstration of professional engagement involves contributing locally and globally to the use of ethical, competent, and creative practices in industry, academia or the public sector. Demonstration of sustained learning involves the ability to adapt to rapid technological, environmental, and organizational changes through self-study and group study and through opportunities of professional development or graduate study. Demonstration of leadership involves the ability to take initiative, and to facilitate the advancements of individuals and the community by influencing others and by having a widespread, positive impact on critical issues and projects. Finally, demonstration of teamwork involves the ability to work with collaborators who have varied expertise, and with diverse cultural and interdisciplinary backgrounds.

As a complement to the instructional activity, the College of Engineering and the College of Liberal Arts and Sciences provide opportunities for each student to have experience with broadening activities. Students have the opportunity to gain practical industry experience in the cooperative education and internship program. Students have the opportunity to participate in advanced research activities. Through international exchange programs, students learn about engineering practices in other parts of the world.

## Curriculum in Software Engineering

Degree requirements leading to the degree Bachelor of Science in Software Engineering.

### Total credits required: 125 cr.

**Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Engineering Basic Program GPA, or Software Engineering Core GPA). See also Engineering Basic Program and Special Programs. Note: Pass/Not Pass credits cannot be used to meet graduation requirements.**

**International Perspectives: 3 cr.**<sup>1</sup>

**U.S. Diversity: 3 cr.**<sup>1</sup>

### Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
LIB 160	Introduction to College Level Research	1
Choose one of the following:		3
ENGL 309	Proposal and Report Writing (C or better in this course)	
ENGL 314	Technical Communication (C or better in this course)	

**Total Credits** **10**

### General Education Requirements: 21 cr.

<sup>2</sup>

Choose 1 course from the following:		3
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
I E 305	Engineering Economic Analysis	
Approved Arts and Humanities or Social Sciences courses		9
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
Choose one of the following ENGL courses (C or better in this course)		3
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>21</b>

### Engineering Basic Program: 24 cr.

A minimum GPA of 2.00 is required for this set of courses (please note that transfer course grades will not be calculated into the Engineering Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (C or better in this course)	3
S E 101	Software Engineering Orientation <sup>3</sup>	R

S E 185	Problem Solving in Software Engineering <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 17 cr.

COM S 227	Object-oriented Programming (C- or better in this course)	4
COM S 228	Introduction to Data Structures (C- or better in this course)	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4
Math Elective: Choose one of the following:		3
MATH 207	Matrices and Linear Algebra	
MATH 265	Calculus III	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 317	Theory of Linear Algebra	
STAT 330	Probability and Statistics for Computer Science	3
<b>Total Credits</b>		<b>17</b>

### Software Engineering Core: 37 cr.

A minimum GPA of 2.00 is required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Software Engineering Core GPA):

CPR E 281	Digital Logic	4
Choose one of the following:		3
COM S 327	Advanced Programming Techniques	
CPR E 288	Embedded Systems I: Introduction	
Choose one of the following:		3
COM S 321	Introduction to Computer Architecture and Machine-Level Programming	
CPR E 381	Computer Organization and Assembly Level Programming	
Choose one of the following:		3
COM S 352	Introduction to Operating Systems	
CPR E 308	Operating Systems: Principles and Practice	
Choose one of the following:		3
COM S 230	Discrete Computational Structures	
CPR E 310	Theoretical Foundations of Computer Engineering	

COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
S E 309	Software Development Practices	3
S E 317	Introduction to Software Testing	3
S E 319	Construction of User Interfaces	3
S E 339	Software Architecture and Design	3
S E 421	Software Analysis and Verification for Safety and Security	3

Note: CPR E 288, CPR E 381, and CPR E 308 are 4-credit courses. The Software Engineering Core credit requirement (37 credits) is given in terms of 3-credit courses. If the 4-credit courses are taken instead, then the extra credits will be used as credits for Supplemental Electives.

<b>Total Credits</b>	<b>37</b>
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### Other Remaining Courses: 26 cr.

S E 166	Careers in Software Engineering	R
S E 491	Senior Design Project I and Professionalism	3
S E 492	Senior Design Project II	2
Software Engineering Electives <sup>2</sup>		9
Supplemental Electives <sup>2</sup>		9
Open Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>26</b>

### Optional Co-op/Internships

Co-op (ENGR 398) or internship (ENGR 396) is optional

### Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a Bachelor of Science in Software Engineering. These 30 credits must include S E 491 Senior Design Project I and Professionalism and S E 492 Senior Design Project II. The Software Engineering degree program requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S Diversity and International Perspectives courses may not be taken Pass/Not Pass.
2. Choose from approved lists (<http://www.se.iastate.edu/academics/>).
3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Engineering Basic Program.



See also: A 4-year plan of study grid showing course template by semester.

Note: International Perspectives and U.S. Diversity courses are used to meet the General Education Electives (<http://www.se.iastate.edu/academics/>).

Software Engineering, B.S.

### Freshman

Fall	Credits Spring	Credits
S E 101	R S E 166	R
S E 185	3 COM S 227	4
MATH 165	4 MATH 166	4
CHEM 167 or 177	4 PHYS 231	4
LIB 160	1 PHYS 231L	1
Economics Elective	3 ENGL 150	3
	<b>15</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
COM S 228	3 S E 319 <sup>1</sup>	3
CPR E 281 <sup>1</sup>	4 COM S 327 or CPR E 288 <sup>1, 2</sup>	3
MATH 267	4 CPR E 310 or COM S 230	3
SP CM 212	3 Math Elective	3
ENGL 250	3 General Education Elective	3
	<b>17</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
S E 309 <sup>1</sup>	3 S E 317 <sup>1</sup>	3
COM S 321 or CPR E 381 <sup>1, 2</sup>	3 S E 339 <sup>1</sup>	3
COM S 311	3 COM S 352 or CPR E 308 <sup>1, 2</sup>	3
COM S 363 <sup>1</sup>	3 ENGL 314 or 309	3
General Education Elective	3 General Education Elective	3
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
S E 491	3 S E 492	2
S E 421 <sup>1</sup>	3 Software Engineering Elective	3
Software Engineering Elective	3 Software Engineering Elective	3
Supplemental Elective	3 Supplemental Elective	3
STAT 330	3 Supplemental Elective	3

Open Elective 3

**15 17**

### Total Credits: 125

\* Total credits required - 125 credits. Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU Cumulative GPA, Engineering Basic Program GPA, or Software Engineering Core GPA). See also Basic Program and Special Programs.

Engineering Basic Program - A minimum GPA of 2.00 is required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Engineering Basic Program GPA)

Must receive a C or better grade in required English classes.

Must receive a C- or better grade in MATH 165, MATH 166, COM S 227, and COM S 228.

General Educational Elective courses to be selected in consultation with Software Engineering Academic Advisors from a list of approved courses. They must include courses that satisfy university and college general education requirements. These courses include courses or categories of courses such as International Perspectives and U.S. Diversity, World Language, Arts and Humanities, and Social Sciences. Pass/Not Pass credit is not accepted.

Software Engineering Electives and Supplemental Electives must be selected from the program-approved list (<http://www.se.iastate.edu/academics/>).

<sup>1</sup> Software Engineering Core (A minimum GPA of 2.00 is required for this set of courses, including any transfer courses but transfer course grades will not be calculated into the Software Engineering Core GPA)

<sup>2</sup> Students who take the 4-credit lab courses CPR E 288, CPR E 308, and CPR E 381 instead of the corresponding 3-credit alternatives can apply the additional credits toward Supplemental Electives. The total number of credits required in the Software Engineering Program remains the same for all students.

The Software Engineering Program has established concurrent undergraduate and graduate programs with the Department of Computer Science, the Department of Electrical and Computer Engineering, and the Ivy College of Business. Please visit <https://se.iastate.edu/academics/> for details.

## Systems Engineering Systems Engineering Master's Degree

Administered by the Department of Industrial and Manufacturing Systems Engineering

The Systems Engineering Program focuses on developing an individual's analytical skills to design, evaluate, and build modern complex

engineered systems. Engineers who can conceptualize, model, and integrate hardware, software, data, and humans are critical in technology driven multi-disciplinary design teams. The Iowa State University Master of Engineering in Systems Engineering Program is designed to train engineers to excel in the technology driven design environment commonly found in developing modern complex engineered systems. The program can be completed on line or in residence, part-time or full-time.

## Admission Requirements

To be considered for admission, the applicant should have a bachelor's degree in engineering or related field from a college, university, or technical school of recognized standing. Non-engineering backgrounds will be considered on a case-by-case basis. High academic achievement or other persuasive evidence of professional accomplishments is expected for admission to the program. The GRE is not required.

Applicants for admission to this program apply through the ISU Graduate College. Each applicant must submit:

- Application and application fee
- Official academic transcripts
- Three letters of recommendation
- Resume

Applications should be submitted as early as possible before the beginning of the semester for which admission is sought. Individuals may also take up to nine credits at Iowa State as a non-degree seeking student and then transfer them to the program when they are admitted. (<https://iowastateonline.iastate.edu/apply-and-enroll> (<https://iowastateonline.iastate.edu/apply-and-enroll/>))

The Master of Engineering in Systems Engineering Program at Iowa State University is focused on supporting working professionals so teaching or research assistantships typically are not available.

## Degree Requirements

(10 courses total = 30 credits)

### Intro Core (required first year)

I E 563	Engineering and Systems Management	3
I E 565	Systems Engineering and Analysis	3

Core (required)

I E 564	Decision Analysis	3
I E 570	Systems Engineering and Project Management	3
I E 585	Requirements and Architecture Engineering	3

Electives

I E 448	Manufacturing Systems Engineering	3
I E 452	Introduction To Systems Engineering And Analysis	3
I E 503	Introduction to Sustainable Production Systems	3

I E 560	Engineering Risk Analysis	3
I E 561	Total Quality Management	3
I E 572	Design and Evaluation of Human-Computer Interaction	3
I E 577	Human Factors	3
I E 581	e-Commerce Systems Engineering	3
I E 582	Enterprise Modeling and Integration	3
AER E 568	Large-Scale Complex Engineered Systems (LSCES)	3
M E 525	Optimization Methods for Complex Designs	3
AER E 563	Introduction to Multidisciplinary Design Optimization	3
One course from any graduate program		3

Students working in research and development who are interested in furthering their research skills may select a creative component option as part of their supporting courses.

## Systems Engineering Certificate

(4 courses total = 12 credits)

Intro Core (required first year)

I E 563	Engineering and Systems Management
I E 565	Systems Engineering and Analysis

Core (required to pick 2)

I E 560	Engineering Risk Analysis	3
I E 564	Decision Analysis	
I E 570	Systems Engineering and Project Management	
I E 585	Requirements and Architecture Engineering	

Other focus areas in related disciplines, such as systems engineering, human factors, supply chain management, or manufacturing, may be substituted for supporting courses. A program of study is developed by the student and academic advisor to fit individual needs.

Students working in research and development who are interested in furthering their research skills may select a creative component option as part of their supporting courses.

# COLLEGE OF HUMAN SCIENCES

Laura Jolly, Dean, Dean's Chair

Jennifer Margrett, Associate Dean Research and Graduate Education

Robert D. Reason, Associate Dean Undergraduate Academic Affairs

Debra Sellers, Associate Dean and Director of Human Sciences Extension and Outreach

[www.hs.iastate.edu/](http://www.hs.iastate.edu/) (<http://www.hs.iastate.edu/>)

The College of Human Sciences (CHS) provides an integrative approach to improving the quality of life for individuals, families, schools and communities by linking discovery, science, creativity, and practice; applying the knowledge of learning in all endeavors; and developing leaders for roles in research, education, business and industry, and health and human services.

The College of Human Sciences, founded in 2005, fosters innovative synergies in teaching and learning in addition to the discovery of new knowledge. Members of the college work to enhance human potential in many ways, and strive to improve the quality of people's lives - helping them learn better, live longer, and lead lives that are more productive and fulfilling.

## Departments/School

- Apparel, Events, and Hospitality Management (<http://www.aeshm.hs.iastate.edu/>)
- Food Science and Human Nutrition (<http://www.fshn.hs.iastate.edu/>)
- Human Development and Family Studies (<http://www.hdfs.hs.iastate.edu/>)
- Kinesiology (<http://www.kin.hs.iastate.edu/>)
- School of Education (<http://www.education.iastate.edu/>)

## Recommended High School Preparation

Recommended preparation for students entering most departments in the College of Human Sciences should include 4 years of English (including speech) with emphasis in composition and communication skills; 3 years each of mathematics and natural sciences, and at least 2 years of social sciences and/or humanities. In addition, students interested in Elementary Education are advised to complete two or more years of high school study in one foreign language.

## Information for Prospective Students

Each student in the College of Human Sciences works closely with an academic advisor who is associated with the program in which the student is majoring. Advisors assist students in developing academic programs and in adjusting to university life. They also provide information and guidance about career choices. Advisors attempt to assist students

as they develop their schedule of classes to meet their goals, interests, and capabilities.

The college offers a number of orientation sessions during the summer for students planning to enter in the fall. Students who enter in spring or summer terms are also offered orientation sessions which are held prior to the beginning of the student's first term. Incoming students are encouraged to attend an orientation session so that academic assessments can be made and appropriate classes may be scheduled for the following term.

## Undecided Students

The College of Human Sciences offers an academic support program for students who are considering several majors in CHS. This program is administered to undecided Human Sciences students through the MINDS Learning Community. Students in the MINDS Learning Community take coursework together, including an orientation and career exploration course which is taught by college advisors. This course provides opportunities for students to evaluate their interests, skills, and strengths while also receiving additional support through a peer mentor program.

All undecided majors in the College of Human Sciences are required to participate in MINDS Learning Community and will sign up for the program during orientation. For more information, visit the MINDS webpage: <https://hs.iastate.edu/learning-community/minds/>. (<https://hs.iastate.edu/learning-community/minds/>)

## Planned Transfer Programs

By planning carefully, students may begin their education at another college and then transfer their courses to a curriculum within the College of Human Sciences with maximum efficiency in meeting the degree requirements. The college works closely with community colleges in Iowa and surrounding states to facilitate a transfer to Iowa State University. For more information, call 1-800-522-0683 or visit the College of Human Sciences Recruitment Office.

## Accreditation and Licensure

The following program-specific accreditation/ licensure/registrations have been attained by departments or School of Education within the college:

### Department of Apparel, Events, and Hospitality Management:

Apparel, Merchandising, and Design major is endorsed by the American Apparel and Footwear Association's Education Foundation. The Design primary option is accredited by the National Association of Schools in Art and Design.

Hospitality Management is accredited by the Accreditation Commission for Programs in Hospitality Administration.

## Department of Food Science and Human Nutrition:

The Food Science degree, including Industry and Technology options are approved by the Institute of Food Technologists.

The Didactic Program in Dietetics and Dietetics Internship are accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics.

The Baccalaureate Degree in Nursing at Iowa State University is pursuing initial accreditation by the Commission on Collegiate Nursing Education (CCNE), One Dupont Circle, NW, Suite 530, Washington, DC 20036, (202) 887-6791. Applying for accreditation does not guarantee that accreditation will be granted. The program has interim approval from the Iowa Board of Nursing.

## Department of Human Development and Family Studies:

The Child Development Laboratory School is accredited by the National Association for the Education of Young Children (NAEYC), Academy for Early Childhood Programs, is licensed by the Iowa Department of Human Services, and maintains a 5 Star Rating from the Iowa Quality Rating System.

The Early Childhood Education Program (administered in collaboration with the School of Education) and the Family and Consumer Sciences Education Teacher Licensure Program are accredited by the Iowa Department of Education and students may be recommended for licensure to the Iowa Board of Educational Examiners.

Financial Counseling and Planning (FCP) is a registered education program with the Certified Financial Planner Board of Standards and the Association for Financial Counseling and Planning Education. With these registrations FCP students are eligible to sit for the Certified Financial Planner™ and Accredited Financial Counselor® examinations.

## Department of Kinesiology:

The Athletic Training program is accredited by the Commission on Accreditation of Athletic Training Education.

The Physical Education Educator Preparation Program is recommended for approval by the Iowa Department of Education and approved by the State of Iowa Board of Education.

## School of Education - Educator Preparation

All Iowa State University Educator Preparation Programs are recommended for approval by the Iowa Department of Education and approved by the State of Iowa Board of Education.

Each student will be enrolled in the School or Department in which he or she plans to major and must meet the graduation

requirements of that department and the college in which it is located.

All candidates must meet the program completion requirements of the Iowa State University Educator Preparation Program in order to be recommended for teacher or educational leadership licensure by Iowa State University.

For details about Teacher Education programs, requirements, and endorsement areas, see Teacher Education. (<https://education.iastate.edu/current-students/educator-preparation-program/>)

For details about Educational Leadership programs and requirements, see Educational Leadership (<https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/>)

## Undergraduate Core Curriculum Purpose

The College of Human Sciences has established core learning outcomes to provide the unifying foundation critical to personal and professional success for all College of Human Sciences undergraduate students. Assessment of College of Human Sciences' core learning outcomes will measure student competence in four (4) areas. Assessment results will be used by CHS faculty and staff to enhance student learning experiences.

### Four components

The core identifies the expected minimum outcomes that each undergraduate in the college must meet:

Communication - Communicate with clear purpose, workable organization and effective style in written, oral, visual and electronic (WOVE) formats without distracting errors in usage or convention.

Self-Assessment/Self Reflection - Consistently and realistically analyze and evaluate one's own knowledge, abilities and actions in comparison to professional standards and create action plans to enhance personal and professional efficacy.

Critical Thinking - Generate, acquire and evaluate information based on scientific evidence, creative processes, and logical and ethical reasoning to make decisions and solve problems in one's personal, professional and community endeavors.

Social Justice - Articulate and demonstrate a clear concept of a just society in which individuals and groups equitably share in societal benefits within a global community.

## Expectations for Departments/School of Education/Programs

Departments/schools/programs formally participate in outcomes assessment. Programs identify courses at three levels (introductory, intermediate, and advanced) where at least one significant educational activity is identified and assessed. Increased achievement and level of mastery at advanced levels is discussed and incorporated through continuous improvement efforts.

## General Education

Students in the College of Human Sciences are required to complete a program in general education which is integrated in their professional training and extends through the undergraduate curriculum.

The general education program emphasizes intellectual growth and personal development as contrasted with specific career preparation.

The program aims to stimulate a desire for learning and intellectual endeavor, develop understanding and appreciation for the physical and cultural world, encourage independent thinking and analysis, increase competence in all aspects of communication, and create an understanding of individuals as social, psychological, and physical beings.

The student is expected to complete studies in three groups in general education. Areas represented below are not departmental titles. In some cases, courses relating to a given area may be found in several different departments. Credits listed are minimum requirements.

Minimum Group Requirements in the College of Human Sciences

I. Communication Skills (10 cr.): ENGL 150, ENGL 250; LIB 160; and 3 credits in oral communication

II. Biological and physical sciences and mathematical disciplines (9 cr.): at least 3 credits in mathematical disciplines

III. Social sciences and humanities (15 cr.): at least 6 credits in social sciences and at least 6 credits in humanities

## Double Majors

Undergraduate students may elect a second major from the departments or school and program areas listed above, or from a major field offered for the bachelor's degree in another college of the university. Double majors may be prohibited between majors as determined by the appropriate curriculum committees.

The major departments must approve the degree program, and if those majors involve two colleges, both deans must approve. Such programs must fulfill the general education requirements of the college of the primary major. If one major leads to the B.A. degree and the other to the B.S. degree, the degree awarded will be the one offered by the department

of the primary major. If the primary major may lead to either a B.A. or a B.S., a student may choose to receive either degree. In this case, the student must satisfy the requirements of each major and of the degree that is chosen for the primary major.

Students with a primary major in another college who wish to take a second major in the College of Human Sciences are required to meet all requirements for the major, prerequisites and supporting courses.

## Two Bachelor's Degrees

Any degree offered by the College of Human Sciences may be earned together with a degree in this or any other college of the university. For the requirements for two degrees, see Index (<http://catalog.iastate.edu/azindex/>), Bachelor's Degree, Two.

## International Programs

The College of Human Sciences encourages students to participate in international programs that will help them to become life-long learners of other cultures and perspectives, to enhance their global citizenship, and to expand their opportunities for employment after graduation. The College offers short-term faculty-led study abroad programs, semester-long programs, international student teaching placements, and dietetic internship rotations.

International opportunities change each year, and students should visit <http://intl.hs.iastate.edu> to review the list of available programs and to explore which offerings are designed for specific majors. The College offers several study abroad scholarships and last year over \$73,000 was awarded to support student participation in our international programs.

Faculty members also bring diversity and global perspectives to instruction through research and collaborations with scholars and institutions abroad, and the College employs faculty members from many different countries.

## Honors Program

High achieving students, with a grade point average of above 3.50, are invited to apply to the Honors Program. Honors students are encouraged to develop a creative program of study expanding their interests while meeting individual educational objectives. Students in the Honors Program also participate in University Honors Seminars, Honors Courses and collaborate with a faculty member to complete an honors project. For further information, contact the College Honors Committee or academic advisor. See <https://hs.iastate.edu/current-students/academics/honors-program/> or look in the Index (<http://catalog.iastate.edu/azindex/>), under Honors Program.

## Human Sciences Extension and Outreach

Students may prepare for a career in the Cooperative Extension System by enrolling in a curriculum in the College of Human Sciences that

provides them with a subject matter base for conducting educational programs for families. Advice on choice of courses should be sought from the Family and Consumer Sciences Education and Studies program, the Associate Dean and Director of Iowa State University Human Sciences Extension and Outreach, and/or the Iowa State University Extension and Outreach 4-H Youth Development Program Leader.

## Undergraduate Majors

**For more information about a major, see:**

1. The curriculum descriptions in this section of the catalog
2. The department catalog section under Courses and Programs
3. Department websites.

## Apparel, Events, and Hospitality Management

### Apparel, Merchandising, and Design

Options: Merchandising and Retail Analytics; Creative and Technical Design; Fashion Communication; and Product Development and Innovation See Curriculum in Apparel, Merchandising, and Design

### Event Management

See Curriculum in Event Management

### Hospitality Management

See Curriculum in Hospitality Management

## Food Science and Human Nutrition

### Culinary Food Science

See Curriculum in Culinary Food Science

### Diet and Exercise B.S./M.S.

Jointly administered with the Department of Kinesiology. See Curriculum in Diet and Exercise

### Dietetics

See Curriculum in Dietetics

### Food Science

Options: Food Science and Industry; Food Science and Technology. See Curriculum in Food Science

Nursing: See Curriculum in Nursing

### Nutritional Science

Options: Pre-Health Professional and Research; Family Health; Food Service; Global Health and Policy; Health Coach; and Nutrition and Wellness. See Curriculum in Nutritional Science

## Human Development and Family Studies

### Human Development and Family Studies

Options: Child Programs; Youth Programs; and Adult/Family Programs. See Human Development and Family Studies

### Early Childhood Education - Unified

Administered jointly by the School of Education and the Department of Human Development and Family Studies. See Curriculum in Early Childhood Education - Unified

### Family and Consumer Sciences Education and Studies

Options: Communications; Professional Studies; Teacher Licensure. See Curriculum in Family and Consumer Sciences Education and Studies

### Financial Counseling and Planning

See Curriculum in Financial Counseling and Planning

### Affiliated Program: Early Childcare Education and Programming.

Offered by the Great Plains Interactive Distance Education Alliance (GPIDEA). See Curriculum in Early Childcare Education and Programming

## Kinesiology

### Athletic Training

See Curriculum in Athletic Training

### Diet and Exercise B.S./M.S.

Jointly administered with the Department of Food Science and Human Nutrition. See Curriculum in Diet and Exercise

### Kinesiology & Health

Options: Community and Public Health; Exercise Science; Physical Activity and Health Promotion; Physical Education Teacher Education; and Pre-Health Professions. See Curriculum in Kinesiology & Health

## School of Education

### Early Childhood Education - Unified

Administered jointly by the School of Education and the Department of Human Development and Family Studies. See Curriculum in Early Childhood Education - Unified

### Elementary Education

Administered by the School of Education. See Curriculum in Elementary Education

### K-12/Secondary Education

The Secondary Education program has three routes, an undergraduate route, a post bachelor route, and a graduate route.

- Undergraduate Secondary Education



Offered in conjunction with subject matter areas, or majors, offered by various departments across the university campus. These subject matter areas include agriculture, biology, chemistry, earth sciences, English, family and consumer sciences, health, history-social sciences, mathematics, music, physics, physical education, and world languages. See Teacher Education

- Post-Bachelor Secondary Education

Coordinated by departments/programs across the university campus. These subject matter areas include agriculture, biology, chemistry, earth sciences, English, family and consumer sciences, health, history-social sciences, mathematics, music, physics, physical education, and world languages. See Teacher Education

- Graduate Secondary Education in the School of Education

Masters of Arts in Teaching in Science Education and Masters of Education in Mathematics Education are coordinated by the School of Education. Other education programs, such as agriculture education, family consumer sciences education, and physical education teacher education, offer masters programs to pursue program completion through their own departments.

## International Studies (secondary major only)

The International Studies Program is an interdisciplinary program which may be taken only as a second major. Students pursuing a second major in international studies must complete the International Studies Program as described in this catalog (see International Studies).

## Undergraduate Minors

Minors are available to all Iowa State students. Minors consist of at least 15 credits including 6 credits taken at Iowa State University in courses numbered 300 or above. A student may not apply the same course to two different minors. The minor must include 9 credits that are not used to meet any other department, college or university requirement. Minors are available in the following areas:

Apparel, Merchandising, and Design

Culinary Food Science

Dance

Educational Services in Family and Consumer Sciences

Event Management

Exercise Science

Financial Counseling and Planning

Food and Society

Food Safety (interdepartmental minor)

Food Science

Gerontology (interdisciplinary minor)

Global Human Sciences

Health Promotion

Hospitality Management

Human Development and Family Studies

Learning and Leadership Sciences

Learning Technologies

Kinesiology

Nutrition

## Graduate Programs

The College of Human Sciences offers a variety of programs leading to a Master's degree, a Ph.D., or a graduate certificate. Each unit offers a variety of program options, as well as opportunities for interdisciplinary study in the areas of gerontology, toxicology, nutritional studies, and genetics. Multiple opportunities for on-campus and distance education programs are available.

## Preparation for Graduate Study

Students considering graduate studies should gain background knowledge in basic subjects related to their area of interest.

Undergraduate mathematics, statistics, and research methods courses are useful as preparation for advanced study in graduate school. Upon completion of graduate programs, students are qualified for leadership positions in business; government agencies; and public and private agencies and institutions; as well as for teaching, research, and extension positions in colleges and universities.

## Information for Prospective Students

Graduate study in the College of Human Sciences is conducted through collaboration with the Graduate College, and application is completed through the Graduate College. Details regarding the application process and general information about graduate studies at ISU are found in the Graduate College section of this catalog, (<http://www.grad-college.iastate.edu/>). Details regarding the curricula and specific expectations for each program are found on department websites.

Each graduate student in the College of Human Sciences works closely with an academic advisor and a Program of Study (POSC) committee.

The POSC assists students in developing academic programs tailored to meet individual needs, guide research and/or internship activities, and provide information and guidance about career choices. Graduate assistantship support is available for many students and involves them in research, teaching, and administrative experiences. Incoming students are encouraged to work with departmental advisors to develop appropriate class and assistantship activities.

## Graduate Curricula

Information about curricula and degree options for each College of Human Sciences unit is available on the unit websites below.

•Apparel, Events, and Hospitality Management – <http://www.aeshm.hs.iastate.edu/graduate-programs/>

•Food Science & Human Nutrition – <http://www.fshn.hs.iastate.edu/graduate-program/>

•Human Development & Family Studies – <https://www.hdfs.hs.iastate.edu/graduate-programs/>

•Kinesiology – <https://www.kin.hs.iastate.edu/graduate-programs/kinesiology/>

•School of Education - <https://education.iastate.edu/graduate-students/graduate-programs/>

## Distance Education Opportunities

The College of Human Sciences offers several online courses and programs. Degrees include PhD, Master's, Undergraduate, and Certificates. Many courses incorporate a blended or hybrid approach, where online students interact with students on campus in real time using webinar services. Some degree programs are provided with a combination of online and condensed schedules that require limited time on campus. Details about these offerings are found on the website at <https://hs.iastate.edu/graduate-students/academics-graduate/online-programs-graduate/>.

Of these programs, six Certificates, one Undergraduate, and four Masters programs are offered through collaboration with the Great Plains Interactive Distance Education Alliance (GP-IDEA; <http://www.gpidea.org/>). These online programs allow students to earn a graduate degree from ISU while taking courses and interacting with students from a number of participating universities. The CHS also offers a Masters of Family and Consumer Sciences-Comprehensive degree online where students have the flexibility to design a program of study the best meets their professional goals.

## Undergraduate Certificates

An undergraduate certificate provides a way to give formal recognition of focused study in a specialized area that is less comprehensive

than required for an undergraduate major. At Iowa State University, an undergraduate certificate is awarded concurrently or after baccalaureate requirements are finished. The following undergraduate certificate is available in the College of Human Sciences:

Health Coach Certificate

## Graduate Certificates

Graduate certificates provide formal recognition of focused graduate study in an area of specialization that is less comprehensive than required for a master's degree. At Iowa State University, a graduate certificate may be earned either before, after, or concurrently with the master's or doctoral degree. The following graduate certificates are available in the College of Human Sciences:

Applied Research Methods in Human Sciences Certificate - see <https://www.education.iastate.edu/graduate-programs/applied-research/>

Community College Teaching Certificate - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-higher-education/ed-d-in-education/>

Development and Family Sciences Advanced Research Design and Methods - see <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/graduate-certificates/>

\* Dietetics Internship Certificate - see [www.dietetics.iastate.edu/](http://www.dietetics.iastate.edu/) (<http://www.dietetics.iastate.edu/>)

Education for Social Justice Certificate - see <https://education.iastate.edu/graduate-students/graduate-programs/school-of-education-certification-programs/education-for-social-justice-graduate-certificate/>

\* Family Financial Planning Certificate - see [www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/](http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/) (<http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/>)

\* Financial and Housing Counseling Certificate - see [www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/](http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/) (<http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/>)

Family Well Being in Diverse Society - see <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/graduate-certificates/>

\* Gerontology Certificate - see [www.hdfs.hs.iastate.edu/graduate-curriculum/ms-fcs/](http://www.hdfs.hs.iastate.edu/graduate-curriculum/ms-fcs/) (<http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-gerontology/>)

\* Infant and Early Childhood Mental Health - see <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/graduate-certificates/>

\* Instructional Design Certificate - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/graduate-certificates/instructional-design-certificate/>

Life Span Development - see <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/graduate-certificates/>

\* Literacy Coaching Certificate - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/graduate-certificates/literacy-coaching-certificate/>

Principal Endorsement (Pre-LEAD) - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/educator-prep-programs-for-licensure-recommendation/transformative-school-leadership-program-licensure-recommendation-m-ed/>

Special Education Certificate - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/graduate-certificates/special-education-instructional-strategist-certificate/>

Superintendent Licensure - see <https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/ed-d-in-education/>

\* Youth Development Specialist - see <http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-youth-development/>

\* Youth Program Management & Evaluation - see <http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-youth-development/>

### \* online certificate

## Apparel, Events, and Hospitality Management Department

The Apparel, Events, and Hospitality Management department offers courses that provide opportunities for students to learn about interdisciplinary areas including aesthetics, leadership, entrepreneurship, and multi-channel retailing at both undergraduate and graduate levels. AESHM courses serve to complement the student's major area of study whether it be Apparel, Merchandising, and Design; Event Management; Hospitality Management; agriculture, business, design education, engineering, liberal arts and sciences or minor areas of study including entrepreneurial studies, design studies, or international studies.

Apparel, Events, and Hospitality Management, otherwise known as AESHM, is composed of three majors:

- Apparel, Merchandising, and Design
- Event Management
- Hospitality Management

Through each of these three programs, students gain skills and knowledge to help them succeed in the real world. In addition to coursework, they complete an internship that closely relates to their career aspirations.

Graduates of these programs are the managers of your favorite resorts, the designers of your best jeans, and the coordinators of lavish events.

From fine dining to fine apparel, our students, alumni, faculty, and staff have an eye for the original and a taste for quality.

### Courses primarily for undergraduates:

#### AESHM 111: Professional Development for AESHM

(1-0) Cr. 1. F.S.

Introduction to professional experiences within AESHM and CHS Career Services including CyHire. Coursework includes resume development, daily habits for success including stress management, intrapersonal skills with a wellness focus, interpersonal skills and leadership, business etiquette, and professional ethics.

#### AESHM 111L: AESHM Program Orientation and Learning Community

(0-2) Cr. 1. F.S.

Orientation to policies and procedures of department and program. Overview of major and minor options, including entrepreneurship. Exploration of undergraduate research, independent studies, study abroad, and field studies. Coverage of goal setting, curriculum planning, degree audits, and registration. Peer mentor interaction in academic, extracurricular, and service learning arranged component.

#### AESHM 170: Supervised Work Experience I

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor permission required; freshman classification or permission*  
Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

#### AESHM 170D: Supervised Work Experience I: Hospitality

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor Permission*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 170F: Supervised Work Experience I: Event Management**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor Permission*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 170N: Supervised Work Experience I: Apparel**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor permission required; freshman classification*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 175: Financial Applications for Retail and Hospitality Industries (2-0) Cr. 2. S.**

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the apparel and hospitality industries.

**AESHM 175D: Financial Applications for Retail and Hospitality Industries: Hospitality Management (2-0) Cr. 2. S.**

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the hospitality industries.

**AESHM 175N: Financial Applications for Retail and Hospitality Industries: Retail Merchandising (2-0) Cr. 2. S.**

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the apparel industries.

**AESHM 180: First Year Student Field Study**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to A M D, HSP M, or EVENT majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.

**AESHM 180E: First Year Student Field Study: Hospitality and Event Management**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to majors in the HSP M and EVENT majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.

**AESHM 180N: First Year Student Field Study: Apparel, Merchandising, and Design**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to A M D majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.

**AESHM 211: Leadership Experiences and Development (LEAD)**

(3-0) Cr. 3. F.S.

Introduction to leadership behaviors. Development and utilization of leadership behaviors to positively impact school life, community life, and work life.

**AESHM 222: Creativity on Demand**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Learn to use creativity strategies to solve everyday problems related to personal and professional lives. Application of creative thinking techniques to view things from different perspectives; identify unique opportunities; and generate and evaluate original ideas.

**AESHM 238: Human Resource Management**

(3-0) Cr. 3. F.S.

*Prereq: A M D 275 or AESHM 270, or AESHM 287 or concurrent enrollment; sophomore classification*

Principles and practices of human resource management relevant to human science-related organizations. Emphasis on the entry-level manager's role.

**AESHM 270: Supervised Work Experience II**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification*

Supervised work experience with a cooperating firm or organization.

Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 270D: Supervised Work Experience II: Hospitality**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification; 6 credits in AESHM or HSP M; Credits in AESHM 170*

Supervised work experience with a cooperating firm or organization.

Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, AESHM 270, and 470 may be applied toward graduation.

**AESHM 270F: Supervised Work Experience II: Event Management**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; 6 credits in AESHM, HSP M, or EVENT*

Supervised work experience with a cooperating firm or organization.

Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 270N: Supervised Work Experience II: Apparel**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification; AMD major*

Supervised work experience with a cooperating firm or organization.

Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 272: Fashion Show Production and Promotion**

(2-2) Cr. 2-3. Repeatable, maximum of 5 credits. F.S.

*Prereq: Application and instructor permission*

Planning and production of fashion show including developing budgets, public relations, advertising, fund-raising, choreography, staging, lighting, and food. Promotion of fashion show and similar events. Maximum of 5 credits can be applied to graduation

**AESHM 280: Orientation to U.S. Field Study**

Cr. R. Repeatable, maximum of 2 times. F.S.

Orientation to the field study location during the semester preceding the trip.

**AESHM 281: Orientation to International Field Study**

Cr. 1. Repeatable, maximum of 2 times. F.S.

Orientation to the field study location during the semester preceding the trip.

**AESHM 287: Principles of Management in Human Sciences**

(3-0) Cr. 3. F.S.

Introduction to management concepts and principles with application to human sciences-related businesses and organizations. Includes service quality management, professionalism, and social responsibility.

**AESHM 311: Seminar on Careers and Internships**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111. Sophomore classification. Good academic standing*

Orientation to AESHM internship policies, professional expectations and responsibilities. Coursework includes career planning including entrepreneurship, internship search strategies and resources, résumés and cover letters, professional branding, portfolios, networking, interview skills, leadership skills, and ethical dilemmas in the workplace.

**AESHM 311E: Seminar on Careers and Internships: Event Management and Hospitality Management**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111; Sophomore classification*

Internship and career planning, professional expectations and responsibilities. Résumé development, business letters/professional correspondence, interviewing techniques, and business etiquette.

**AESHM 311N: Seminar on Careers and Internships: Apparel, Merchandising, and Design**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111; Sophomore classification*

Internship and career planning, professional expectations and responsibilities. Résumé development, cover letters, interviewing techniques, and business etiquette.

**AESHM 340: Hospitality and Apparel Marketing Strategies**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101*

Application of marketing principles to the hospitality-, events-, and apparel-related industries. Emphasis on the role of marketing in an organization's overall strategic planning. Development and evaluation techniques available to hospitality, events, apparel, and related businesses, including advertising, sales promotion, packaging, and public relations.



**AESHM 342: Aesthetics of Consumer Experience**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Design principles, aesthetic concepts, and research applied to consumer experiences, with an emphasis on hospitality and retail environments and events. Influence of individual differences and cultural patterns on aesthetic preferences.

**AESHM 365: Event, Hospitality, and Retail Risk Management**

(3-0) Cr. 3. SS.

Overview and management of hazards and risks in the planning, design, operation, and evaluation stages of events, hospitality organizations, and apparel/retail environments.

**AESHM 380: U.S. Field Study**

(Dual-listed with AESHM 580). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380D: U.S. Field Study: Hospitality Management**

(Dual-listed with AESHM 580D). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in AESHM or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380F: U.S. Field Study: Event Management**

(Dual-listed with AESHM 580F). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in EVENT, AESHM, or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the majors in the Event Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380N: U.S. Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 580N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 381: International Field Study**

(Dual-listed with AESHM 581). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 381D: International Field Study: Hospitality Management**

(Dual-listed with AESHM 581D). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 381F: International Field Study: Event Management**

(Dual-listed with AESHM 581F). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Event Management major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.



**AESHM 381N: International Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 581N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq:* 9 credits in A M D and/or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq:* Permission of Advisor; Junior classification

Required of all cooperative education students seeking full-time status. Students register for this course prior to commencing each work period.

**AESHM 421: Developing Global Leadership: Maximizing Human Potential**  
(3-0) Cr. 3. S.

Development of leadership in a global environment. Focus on global concerns that impact on the well-being of individuals, families, and communities. Strategies for working with individuals, families and communities in other countries and cultures. Taking local action on global issues. Participation in a service activity.

Meets International Perspectives Requirement.

**AESHM 470: Supervised Professional Internship**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq:* AESHM 311 (all majors); EVENT 271 (Event Management majors); AESHM 211 (Hospitality Management majors)

Supervised work experience with a cooperating firm or organization, documentation of experience, and completion of an internship project. Coursework includes weekly self-reflection and topics related to current issues and career advancement. Employer/experience should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, AESHM 270, and AESHM 470 may be applied toward graduation

**AESHM 470F: Supervised Professional Internship: Event Management**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq:* Permission by application; Junior classification

Supervised and structured practical industry work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. This course is offered for a grade. Maximum number of credits given in a semester is 6. No more than 12 credits from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 470N: Supervised Professional Internship: Apparel**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq:* AESHM 311, 9 credits in A M D, and minimum 2.0 GPA; permission by application; junior or senior classification; employer/experience should be different than employer/experience for AESHM 170 and 270

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 472: Fashion Show Management**

(2-2) Cr. 2-3. Repeatable, maximum of 5 credits. F.S.

*Prereq:* Permission of Instructor

Provide leadership and communicate direction for planning and production of fashion show, including developing budgets, publicity, advertising, fundraising, choreography, staging, lighting, and food. Maximum of 5 credits can be applied to graduation

**AESHM 474: Entrepreneurship in Human Sciences**

(3-0) Cr. 3. F.S.

*Prereq:* A M D 275 or AESHM 287 or ACCT 284 or 3 cr in MKT or permission of instructor

Comprehensive approach to entrepreneurship including concepts of innovation, creativity, opportunity assessment, and business planning. Focus on human sciences-related businesses: retail, service, hospitality, event, food-related, family-owned, rural, and community businesses. Interaction with entrepreneurs, market research, feasibility analysis, business proposals, and business/community outreach and consulting.

**AESHM 490H: Independent Study: Honors**

Cr. 2-4. Repeatable. F.S.SS.

*Prereq:* Permission of Instructor; Full membership in Honors Program

**AESHM 497: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq:* Permission of Advisor; Senior or graduate classification

Required of cooperative education students. Students must register for this course prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AESHM 501: Introduction to Scholarly Research for Graduate Students**

Cr. 1. F.S.SS.

Focus on the basics of developing scholarly research, including definition and purpose of research and the components of research reporting. Emphasis on standards for each section of research reports. Tips for research reporting and processes of research development. An introduction to ethical standards. Required of all new AESHM graduate students. Offered on a satisfactory-fail basis only.

**AESHM 502: Research Methods in Apparel, Events, and Hospitality (3-0) Cr. 3. SS.***Prereq: Enrolled in graduate program*

Overview of research methods for qualitative, quantitative, and mixed methods. Topics include philosophical worldviews, the use of theory, and different research approach, design, methodologies, and procedures.

**AESHM 510: Quantitative Research Methods in Apparel, Events, and Hospitality**

Cr. 3. Alt. S., offered odd-numbered years. Alt. SS., offered odd-numbered years.

*Prereq: STAT 587 or equivalent; Graduate standing in the Department; Permission of instructor*

Overview of quantitative research methods in apparel and hospitality fields. Topics include types of quantitative research design, sampling design, measurement, validity issues, power and precision analysis, methods of data gathering and analysis techniques, and interpretation of statistical results. Use of statistical packages. Development of research plan.

**AESHM 511: Seminar**

Cr. 1-3. Repeatable, maximum of 6 times.

*Prereq: 6 graduate credits in A M D, AESHM, or HSP M. Permission of instructor*

Discussion of scholarship and current issues. Topics vary.

**AESHM 512: Qualitative Research Methods in Apparel, Events, and Hospitality**

Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: Graduate status*

Introduction to and hands-on experiences with a variety of qualitative research methods specific to apparel, events and hospitality research. Students will develop skills at research design, data, collection, analysis, and write-up for qualitative inquiry.

**AESHM 570: Practicum**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 570A: Apparel Merchandising and Design**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 570B: Hospitality Management**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 574: Entrepreneurship in Human Sciences**

(3-0) Cr. 3. F.S.

*Prereq: A M D 275 or AESHM 287 or ACCT 284 or 3 cr in MKT or permission of instructor*

Comprehensive approach to entrepreneurship including concepts of innovation, creativity, opportunity assessment, and business planning. Focus on human sciences-related businesses: retail, service, hospitality, event, food-related, family-owned, rural, and community businesses. Interaction with entrepreneurs, market research, feasibility analysis, business proposals, and business/community outreach and consulting.

**AESHM 579: Data Analytics for Apparel, Event, and Hospitality Management**

(3-0) Cr. 3. Alt. F., offered even-numbered years. Alt. SS., offered odd-numbered years.

*Prereq: STAT 587 or equivalent (AESHM 510, HD FS 503) or permission of instructor*

Business analytics is a process of transforming data into meaningful insights and actionable results in the context of decision making and problem solving. Review of the data-related challenges apparel, event, and hospitality organizations confront and the importance of data analytics in making critical management decisions. Basic analytic techniques including data management, analysis, interpretation, and visualization and analyze case studies that successfully deployed these techniques.

**AESHM 580: U.S. Field Study**

(Dual-listed with AESHM 380). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580D: U.S. Field Study: Hospitality Management**

(Dual-listed with AESHM 380D). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in AESHM or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*  
Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580F: U.S. Field Study: Event Management**

(Dual-listed with AESHM 380F). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in EVENT, AESHM, or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the majors in the Event Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580N: U.S. Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 380N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 581: International Field Study**

(Dual-listed with AESHM 381). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 581D: International Field Study: Hospitality Management**

(Dual-listed with AESHM 381D). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 581F: International Field Study: Event Management**

(Dual-listed with AESHM 381F). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Event Management major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 581N: International Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 381N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D and/or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**Courses for graduate students:**

**AESHM 611: Seminar**

Cr. 1-3. Repeatable.

*Prereq: 6 graduate credits in AESHM, A M D, or HSP M. Permission of instructor*

Scholarship and current issues. Topics vary.

**AESHM 670: Teaching Practicum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670A: Teaching Practicum: Apparel Merchandising and Design**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670B: Teaching Practicum: Hospitality Management**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670C: Teaching Practicum: Event Management**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

This practicum is designed to provide event management graduate students (the graduate instructor) with experience in instructional planning, management, and systematic delivery of designed instruction for event undergraduate courses. Proposal must be approved semester before placement.

**Courses primarily for undergraduates:****A M D 121: Apparel Assembly Processes**

(2-4) Cr. 4. F.S.

Principles of garment and textile-related product assembly taught using industrial machines and production equipment. Construction techniques build in complexity in the development, assembly, and analysis of component parts and complete garments. Concurrent enrollment in A M D 204 recommended.

**A M D 131: Fashion Products and Markets**

(3-0) Cr. 3. F.

Fashion industry from concept to consumer. Focus on fashion-driven consumer goods. Development and prototyping of fashion products for a target market.

**A M D 165: Dress, Appearance, and Diversity in U.S. Society**

(3-0) Cr. 3. F.S.

Analyze foundational concepts and theories related to dress, identity, fashion, and culture and how they intersect with sex, gender, sexuality, beauty, attractiveness, disability, religion, race, and ethnicity with heightened attention to marginalized communities in the United States. Analyze the experiences and the role of fashion, clothing, dress, and/or accessories for identity development. Critique the social justice issues within the fashion system and identify the driving forces of transformative social justice change in the fashion system. Deconstruct one's personal values and positionalities in relation to fashion, clothing, dress, and/or accessories.

Meets U.S. Diversity Requirement

**A M D 178: Introduction to Apparel Design Studio**

(0-6) Cr. 3. F.S.

Introduction to the elements and principles of design in fashion and apparel including skill development in fashion illustration, technical drawing, and fabric rendering using traditional media. Application of written and verbal presentations to communicate fashion and apparel design concepts and terminology. Fashion presentation and introduction to portfolio development.

**A M D 204: Textile Science**

(3-2) Cr. 4. F.S.

*Prereq: A M D 131*

Textile fibers, yarns, fabrication, coloration, and finishes. Quality and performance application to textile products. Lab work included.

**A M D 206: Design Selective Advancement**

Cr. R. Repeatable, maximum of 2 times. F.S.

*Prereq: Completion or enrollment in A M D 121, A M D 131, A M D 165, A M D 178, and A M D 204 with subset 2.5 GPA, 2.0 cumulative GPA (including transfer work), and enrollment in major*

Project review and skill assessment related to 2-dimensional and 3-dimensional visualization, apparel assembly, basic product knowledge, design problem solving, illustration, textiles. Grade point averages are part of scoring process. Offered on a satisfactory-fail basis only.

**A M D 210: Computer Applications in Digital Design**

(2-2) Cr. 3. F.S.

*Prereq: A M D 245*

Applications of skills in Photoshop, Illustrator, InDesign, Google Sketch-up, Excel, and website development. Introduction to digital product design and line development. Focus on elements and principles of design. Introduction to digital portfolio development for design and merchandising. In-class demonstrations and online lectures.

**A M D 225: Patternmaking I: Drafting and Flat Pattern**

(1-4) Cr. 3. F.S.

*Prereq: A M D 121, A M D 204, A M D 206. Permission of instructor.*

Application of patternmaking tools and their functions, measurement techniques, pattern labeling, and patternmaking communication documents. Sloper drafting and flat pattern manipulation methods for women's apparel. Design and construction of original garments using drafted slopers and flat pattern manipulation methods to enable the analysis of fit.

**A M D 231: Product Development and Manufacturing**

(3-2) Cr. 4. F.S.

*Prereq: A M D 204*

Analysis of apparel product development, sourcing, and manufacturing processes. Focus on materials and specifications relative to quality, performance, cost, and price. Applications of software for PLM.

**A M D 245: Aesthetics and Brand Image**

(3-0) Cr. 3. F.S.

*Prereq: A M D 131; A M D 165; credit or concurrent enrollment in A M D 204*  
Elements and principles of design. Analysis of sensory, expressive, and symbolic aspects that build brand image, with a focus on fashion products and promotional settings.

**A M D 257: Museum Studies**

(3-0) Cr. 3. F.

*Prereq: Sophomore standing*

Overview of museums including history, functions, and philosophy. Collection and curatorial practices. Funding and governance issues. Hands-on object research and exhibit development. Required field trip.

**A M D 275: Retail Merchandising**

(3-0) Cr. 3. F.S.

*Prereq: 3 credits in Math*

Principles of merchandising as applied to retail-, service-, events-, and hospitality-related businesses. Study of the planning, development, and presentation of apparel- and hospitality-related products, services, and experiences. Industry and market research, planning of new offerings, and development of promotional and competitive strategies for various retail formats.

**A M D 278: Fashion Illustration**

(0-6) Cr. 3. F.S.

*Prereq: A M D 178, A M D 210 or concurrent enrollment, A M D 245 or concurrent enrollment. Permission of instructor.*

Development of fashion plates and focused apparel lines/collections. Proficiency in drawing the fashion figure, technical drawings/flats, and apparel using a variety of media. Continuation of fashion presentation and portfolio development.

**A M D 288: Styling**

(3-0) Cr. 3. F.S.

*Prereq: A M D 131; A M D 275*

Focus on the many facets of the styling profession, including commercial styling, editorial (magazine) styling, personal style consultation, and red-carpet styling. Study of the practical requirements of the profession and the importance of an appropriate digital presence. Course will utilize a hands-on approach with lectures and projects.

**A M D 290: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshmen or Sophomore Classification; Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. Total number of A M D 290 and A M D 490 credits applied to graduation cannot exceed 9 credits.

**A M D 290R: Independent Study: Professional Practice**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshmen or Sophomore Classification; Permission of instructor, advisor, and department chair.*

Experiences in teaching assistantship for first-year and second-year students. Total number of A M D 290 and A M D 490 credits applied to graduation cannot exceed 9 credits.

**A M D 305: Quality Assurance of Textiles and Apparel**

(Dual-listed with A M D 505). (2-2) Cr. 3. F.

*Prereq: A M D 204, A M D 231, one course in natural science; STAT 101, or STAT 226, or STAT 587*

Principles of product and materials evaluation and quality assurance. Developing specifications and using standard practices for evaluating materials, product characteristics, performance, and quality.

**A M D 310: Computer Aided Apparel Patternmaking**

(0-6) Cr. 3. F.S.

*Prereq: A M D 210, A M D 225; Permission of instructor.*

Introduction to the computer-aided patternmaking software related to pattern modification, pattern drafting, grading, marker making, and 3-D virtual fitting.

**A M D 321: Computer Integrated Textile and Fashion Design**

(0-6) Cr. 3. F.S.

*Prereq: A M D 210, A M D 278 or concurrent enrollment. Permission of instructor*

Analysis and advanced use of computer-aided design software for soft-good fabrication design for various target markets. Development of digital presentation for portfolio integration.

**A M D 325: Patternmaking II: Draping**

(0-6) Cr. 3. F.S.

*Prereq: A M D 206, A M D 225; permission of instructor.*

Principles of patternmaking through basic draping techniques. Application of draping techniques to sportswear and formal wear garments. Analysis of fit and design; problem solving and interaction of fabric characteristics with style features.

**A M D 328: Apparel, Merchandising, and Design Seminar**

Cr. 1-3. Repeatable. F.S.SS.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.



**A M D 328T: Apparel, Merchandising, and Design Seminar: Fashion Trend Forecasting**

Cr. 1-3. F.S.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.

**A M D 328Y: Apparel, Merchandising, and Design Seminar: Styling**

Cr. 1-3.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.

**A M D 329: Digital Textile Printing for Apparel Design**

(2-2) Cr. 3. F.S.

*Prereq: A M D 321; A M D 325 or concurrent. Permission of instructor*

Overview of the use of digital printing in the textile and apparel industry, color matching, repeat print patterns, engineered prints, and creation of apparel prototypes.

**A M D 354: Euro-American Dress History: Prehistoric to Mid-19th Century**

(3-0) Cr. 3. F.

Survey of history of dress from ancient times up to the American Civil War; focus on European and North American dress. Emphasis on connection of dress to the social, cultural, environmental, and technological contexts of the Western world.

Meets International Perspectives Requirement.

**A M D 356: Euro-American Dress History: Mid-19th Century to the Present**

(3-0) Cr. 3. S.

Survey of major design and technological developments from the 1870s through the present. Emphasis on fashion as a system of design and production, culture of consumption, fashion change, and trends in art, society, and culture. A M D 204 recommended.

**A M D 362: Cultural Perspectives of Global Dress**

(3-0) Cr. 3. S.

Analysis of multiple factors related to dress in selected societies, including technology, cultural identity, aesthetics, social organization, ritual, stability and change. Applications to fair trade and social responsibility.

Meets International Perspectives Requirement.

**A M D 372: Sourcing and Global Issues**

(3-0) Cr. 3. F.S.

*Prereq: A M D 231; A M D 275*

Evaluation of key issues facing textile and apparel industries in global markets considering ethical, economic, political, social, and professional implications. Sourcing strategies in a global environment. Corporate and consumer social responsibility and sustainability. ECON 101 or ECON 102 recommended.

Meets International Perspectives Requirement.

**A M D 375: Omni-Channel Retailing**

(3-0) Cr. 3. S.

*Prereq: 3 credits in marketing or A M D 275 or AESHM 287*

A customer-centric view of marketing with a focus on the retailer-customer relationship and omni-channel strategies. Analysis and evaluation of integrated retail applications and strategies using digital media, including store formats, e-commerce, catalog, mobile, crowdsourcing, and social media.

**A M D 376: Merchandise Planning and Buying**

(3-2) Cr. 4. F.S.

*Prereq: A M D 275; COM S 113; 3 credits from ACCT 284, MATH 104, MATH 105, MATH 140, MATH 150, or equivalent.*

Calculations and computer application in the planning and control of merchandise. Emphasis on retail math as it pertains to assortment planning, the six-month buying plan process, and other buying concepts and strategies. Online modules.

**A M D 377: Visual Presentation and Promotions**

(3-0) Cr. 3. F.S.

*Prereq: A M D 210; (A M D 245 or AESHM 342); (MKT 340 or AESHM 340)*

Principles of visual aspects of brand development and management; emphasis on branding, visual merchandising, design/layout of retail spaces. Includes applications such as visual communication and documentation using Adobe Creative Suite(R), hands-on display projects, and brand case studies.

**A M D 388: Trend Forecasting**

(3-0) Cr. 3. F.S.

*Prereq: A M D 204, A M D 245, A M D, 275, 3 credits from ACCT 284, MATH 104, MATH 105, MATH 140, MATH 150, or equivalent*

Explore many facets of fashion forecasting, including trend research, managing inspiration sources and trend ideas, product adoption, degrees of difference, and turning a fashion forecast into a buying plan. Applications of fashion forecasting will be examined, who does it and how it fits into various careers. The course will utilize a hands-on approach with lecture, discussion, and projects.



**A M D 393: Apparel, Merchandising, and Design Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: A M D Junior or Senior Classification and Permission of Instructor.*

Intensive 2- to 8-week workshop exploration. Topics vary each time offered. Maximum of 6 credits applied to graduation.

**A M D 404: Innovative Textiles**

(Dual-listed with A M D 504). (2-2) Cr. 3. S.

*Prereq: A M D 204, CHEM 163 and CHEM 163L or equivalent*

Theories and principles of textile science. Textile product serviceability. Effect of fiber structure on properties and performance. New developments in textiles.

**A M D 415: Technical Design Processes**

(2-2) Cr. 3. F.

*Prereq: A M D 225; A M D 231*

Garment development and analysis of fit, performance, quality, cost. Exploration of alternative materials, construction methods, grading; specifications and portfolio development.

**A M D 426: Creative Design Processes**

(1-4) Cr. 3. S.

*Prereq: A M D 206, A M D 321, A M D 325 or concurrent*

Exploration of the creative apparel design process and sources of inspiration with emphasis on activist design, wearable art; experimentation of advanced design problem solving, alternative materials, fabric manipulation, and pattern-making techniques.

**A M D 431: Apparel Production Management**

(2-2) Cr. 3. S.

*Prereq: A M D 231; A M D 372*

Procedures and experiences related to application and use of process controls: method analysis, work measurement, costing, pricing, and production planning. Resource management, technology applications, and quality assurance. A M D 121 recommended.

**A M D 458: Queer Fashions: History, Culture, and the Industry**

(Dual-listed with A M D 558). (Cross-listed with WGS, WGS). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and inequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**A M D 467: Consumer Studies in Apparel and Fashion Products**

(3-0) Cr. 3. F.

*Prereq: A M D 165; (AESHM 340 or MKT 340); (STAT 101 or STAT 104 or STAT 226)*

Application of concepts and theories from the social sciences to the study of consumer behavior related to dress, textile and apparel products, and retail experiences. Experience in conducting consumer research.

**A M D 475: Retail Analytics**

(2-2) Cr. 3. F.S.

*Prereq: A M D 376*

Evaluation of information needed to make effective retail decisions. Use of technology in analyzing and interpreting retail systems data. Application of concepts related to forecasting, consumer demand, assortment planning, market research, data mining, database interface, pattern recognition, supply-chain/logistics management, retail technology applications.

**A M D 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

Independent Study. Maximum of 9 credits of both A M D 290 and A M D 490 can be applied toward graduation.

**A M D 490A: Independent Study: Textile Science**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490B: Independent Study: Historical, Cultural, and Museum Studies of Dress and Textiles**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490C: Independent Study: Textile and Apparel Design**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490E: Independent Study: Merchandising, Aesthetics, and Entrepreneurship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490F: Independent Study: Sociological, Psychological, and Consumer Behavioral Aspects of Dress**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490H: Independent Study: Honors**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490J: Independent Study: Product Development, Innovation, and Sourcing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490R: Independent Study: Professional Practice**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair.*

**A M D 490S: Independent Study: Production and Quality Assurance**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490W: Independent Study: Fashion Show, Fashion Public Relations and Marketing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 495: Senior Design Studio**

(Dual-listed with A M D 595). (0-6) Cr. 3. F.

*Prereq: A M D 310, A M D 325 and A M D 329. Permission of instructor.*

Creation of an apparel line from target market research to prototypes through the use of manual techniques and CAD technologies. The line is to be included in a professional portfolio and pieces submitted to a juried exhibition.

**A M D 496: Soft-Goods Product Development and Prototyping**

(3-0) Cr. 3. S.

*Prereq: A M D 231, A M D 245, A M D 275, A M D 321*

Capstone soft-good innovative product development course focusing on product development through design thinking and practice. Applying consumer, aesthetic, and quantitative trend information to develop value-added soft-good products and product lines for diverse target markets. Integrated course with industry partner(s) with development of a prototype and presentation for portfolio integration.

**A M D 499: Undergraduate Research**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Senior classification, 15 credits in A M D. Permission of instructor, advisor, and department chair*

Research experience in textiles and clothing with application to a selected problem.

**Courses primarily for graduate students, open to qualified undergraduates:**

**A M D 504: Innovative Textiles**

(Dual-listed with A M D 404). (2-2) Cr. 3. S.

*Prereq: A M D 204, CHEM 163 and CHEM 163L or equivalent*

Theories and principles of textile science. Textile product serviceability. Effect of fiber structure on properties and performance. New developments in textiles.

**A M D 505: Quality Assurance of Textiles and Apparel**

(Dual-listed with A M D 305). (2-2) Cr. 3. F.

*Prereq: A M D 204, A M D 231, one course in natural science; STAT 101, or STAT 226, or STAT 587*

Principles of product and materials evaluation and quality assurance. Developing specifications and using standard practices for evaluating materials, product characteristics, performance, and quality.

**A M D 510: Foundation of Scholarship in Apparel, Merchandising, and Design**

(3-0) Cr. 3. F.

*Prereq: Graduate classification or permission of instructor*

Overview of scholarship in apparel, merchandising, and design with emphasis on current and future directions. Fundamentals of writing literature reviews. Examination of ethical issues in scholarship and academic life. Introduction to creativity, sustainability, and entrepreneurship.

**A M D 521: Digital Technologies in Textile and Apparel**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Research Methods course. Permission of instructor.*

Digital technologies in textile and apparel design. Theories and practices connected to technology in apparel fields. Technologies explored in this class may include digital textile design and printing, 3D body scanning, avatar development for digital fitting or other advanced technologies used in the textile and apparel industries.

**A M D 525: Experimental Patternmaking**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AMD 121 or equivalent, AMD 225 or equivalent, AMD 510 or taking concurrently, permission of instructor*

Research, analyze, and apply experimental patternmaking techniques to original garments suitable for entry into a juried competition/exhibitions. Compare, contrast, and organize a framework of research patternmaking principles through content analysis or other appropriate research techniques. Documentation of learning and design process.

**A M D 539: Digital Textile Design and Theory**

Cr. 3. Repeatable. Alt. S., offered even-numbered years.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term.

**A M D 545: Consumer Experience and Retail Branding**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: One course in design elements and principles, psychology, consumer behavior, or marketing*

Examination of hedonic nature of consumer experience and its application to experiential design and branding of retail/hospitality establishments. Emphasis on consumer behavior, environmental psychology, and marketing literature.

**A M D 554: Dress History Research Methods**

Cr. 3. Alt. S., offered odd-numbered years.

Using a variety of sources and methods of analysis, students will develop their ability to read and interpret primary and secondary sources and to understand the methodology underpinnings and process of constructing dress history.

**A M D 558: Queer Fashions: History, Culture, and the Industry**

(Dual-listed with A M D 458). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and unequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**A M D 565: Sustainability: Theory and Practical Application**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 3 credits in research methods; basic knowledge of apparel industry and product development; permission of instructor.*

Overview of current sustainability theory, research, and methodology. Emphasis on the evaluation and discussion of current sustainability literature and sustainable practice of apparel, textiles, and related products and services through people, processes, and the environment. Development and presentation of original scholarly and creative design work under various sustainability frameworks.

**A M D 567: Consumer Behavior and Apparel**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A M D 467 or MKT 447; STAT 401*

Application of concepts and theories from the social sciences to the study of consumer behavior. Experience in conducting research; manuscript writing.

**A M D 572: Sourcing and Global Issues**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A course in merchandising, marketing, or economics*

Evaluation of textile and apparel industries in global markets considering ethical, economic, political, social, and professional implications. Sourcing strategies in a global environment. Corporate and consumer social responsibility and sustainability. Experience in conducting research using secondary data.

Meets International Perspectives Requirement.

**A M D 576: Industry Applications in Merchandising and Management**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A M D 376 or equivalent; A M D 275 or equivalent; or permission of instructor*

Using the case study method, students apply merchandising theory, principles, and practices to industry scenarios. Emphasis on problem solving, creative thinking, data analysis, and data interpretation involved in business operations. Focus on the development of leadership skills while functioning in small and large groups.

**A M D 577: E-Commerce for Apparel and Hospitality Companies**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Course in marketing or permission of instructor*

Analysis of technology and consumer trends, industry practices, and marketing strategies for e-commerce including big data, data mining, and social media. Evaluation and development of apparel or hospitality company websites. Theory application to the development of multi-channel business strategies.

**A M D 578: Social Network Analysis**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: STAT 587 or equivalent*

Introduction to social network related theories, practices and analyses. Visualize and analyze social structures, formed from social relationships, interactions, communications, and social media activities. Explore methods for social network data collection and data management, including application on big data. Practical guidelines on conducting SNA research in social science contexts, including applying SNA with big data.

**A M D 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590A: Special Topics: Textile Science**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590B: Special Topics: Historical, Cultural, and Museum Studies of Dress and Textiles**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590C: Special Topics: Textile and Apparel Design**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590E: Special Topics: Merchandising, Aesthetics, and Entrepreneurship**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590F: Special Topics: Sociological, Psychological, and Consumer Behavioral Aspects of Dress**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590J: Special Topics: Product Development, Innovation, and Sourcing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590S: Special Topics: Production and Quality Assurance**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590W: Special Topics: Fashion Show, Fashion Public Relations and Marketing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 595: Senior Design Studio**

(Dual-listed with A M D 495). (0-6) Cr. 3. F.

*Prereq: A M D 310, A M D 325 and A M D 329. Permission of instructor.*

Creation of an apparel line from target market research to prototypes through the use of manual techniques and CAD technologies. The line is to be included in a professional portfolio and pieces submitted to a juried exhibition.

**A M D 599: Creative Component**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in A M D*

**Courses for graduate students:**

**A M D 611: Seminar**

Cr. 1-3. Repeatable.

*Prereq: 6 graduate credits in A M D. Permission of instructor*

Discussion of scholarship and current issues. Topics vary.

**A M D 625: Design Theory and Process**

(2-4) Cr. 4. Alt. S., offered even-numbered years. Alt. SS., offered even-numbered years.

*Prereq: Permission of instructor.*

Analysis and application of design theory and creative processes, including strategies for solving aesthetic, functional, and/or technology-focused design problems. Creation and dissemination of design scholarship.

**A M D 665: Cultural and Social Science Theories in Fashion Studies**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Analysis of cultural and social science theories, concepts, frameworks, and epistemologies applicable to fashion, style, and dress research. Emphasis on qualitative research, theoretical interpretation, and theory development. Example theories examined include Black feminist theories, critical race theory, feminist queer crip, tribalcrit, symbolic interaction, and semiotics. Collection, analysis, and interpretation of qualitative data.

**A M D 676: Merchandising Theory and Research Applications**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: A M D 275 or equivalent; statistics course recommended.*

Review of current merchandising theory, research, and methodology. Emphasis on the evaluation and discussion of current and seminal merchandising literature, understanding research processes, interpretation of findings, assessing implications of research for future directions in merchandising, and the development and presentation of original scholarly work.

**A M D 690: Advanced Topics**

Cr. arr. Repeatable.

*Prereq: Enrollment in doctoral program, permission of instructor; and approval of D.O.G.E*

**A M D 699: Research**

Cr. arr. Repeatable.

**Courses primarily for undergraduates:**

**EVENT 171: Introduction to Event Management**

(3-0) Cr. 3. F.S.

Overview of the event management industries. Techniques and procedures required for designing and implementing successful events.

**EVENT 203: Event Management Sophomore Mentorship**

(1-2) Cr. 2.

*Prereq: Sophomore classification; AESHM 111; EVENT 171; by application only*

Event Management sophomore students will be paired with a professional mentor in the event industry. Students will meet in the class and individually with their professional mentor throughout the spring semester. Students will be assessed on their experience through reflection, presentation, and mentor evaluation.

**EVENT 212: Digital Production in Event Management**

(2-2) Cr. 3. F.S.

Applications of skills in Adobe Suite and other software technologies. Introduction to design elements used within the event management industry with a focus on digital publishing of marketing and promotional materials, wayfinding, and other stationery items. Face-to-face lecture and laboratory work.

**EVENT 277: Introduction to Digital Promotion in Event Management**

(3-0) Cr. 3. S.SS.

*Prereq: EVENT 171 or HSP M 101 or A M D 131*

Event management digital channels and platforms, including display advertising, search advertising, social media, and mobile. Students will be introduced to the most popular event management platforms as well as digital event management topics of visual marketing, digital media planning, and content marketing.

**EVENT 290: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshman or Sophomore Classification. Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. No more than 9 credits of EVENT 290 and EVENT 490 may be applied towards graduation requirements.

**EVENT 328: Incentive Meeting Management**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

Overview of the incentive meeting industry. Focus on incentive meeting planning, destination selection, program development, risk management, cultural aspects of destination, incentive meeting execution, and incentive meeting evaluation.

**EVENT 333: Entertainment Venue Management**

(3-0) Cr. 3. F.

*Prereq: EVENT 171; Event Management major or minor*

Organization and management of various types of entertainment venues including clubs, theaters, auditoriums, and arenas.

**EVENT 367: Event Sales**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; (AESHM 340 or MKT 340)*

Overview of sales marketing management in the event industry and highlights of the role of the professional event sales manager in the marketing process. As an event professional, students will identify best sales practices to develop their personal selling style, to build on their strengths, and to create a referral business that delivers results. Principles covered include evaluation of characteristics and skills necessary for success in sales; strategic planning; sales leadership; analyzing customers and markets; designing and developing the sales force; recognize the importance of relationship building; process management; and measurement, analysis, and knowledge management.

**EVENT 371: Conference and Meeting Planning**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Sophomore classification*

Application of event management principles to conference and meeting planning. Providing a comprehensive introduction to the key planning elements of the global conference, convention and meetings.

**EVENT 373: Wedding Planning and Management**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

Overview of wedding event industry. Focus on wedding planning processes and implementation, design, and business planning and development.

**EVENT 378: Sustainable Event Management**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Event Management major/minor only*

Introduction to organizing sustainable events. Discussion of the business case for sustainability in the events industry, as well as practical solutions for reducing environmental and social impacts in accordance with the United Nations Sustainable Development Goals (SDG).

**EVENT 379: Nonprofit Fundraising Event Planning**

(3-0) Cr. 3. F.

*Prereq: EVENT 171; Event Management major or minor*

Foundation of the principles and practice of event fundraising. Opportunity to apply fundraising concepts and techniques by developing a plan for own, or a nonprofit organization.

**EVENT 383: Sports Event Management**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

A comprehensive overview of sports and recreation competitions, events, and facilities. Best practices in sports event management, sports organizations, and franchises across the industry. In depth look at athlete and guest services, game day operations, marketing, sponsorship, and post-competition.

**EVENT 393: Event Management Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: EVENT Junior or Senior classification; Permission of Instructor*

Topics vary each time offered. Maximum of 6 Event 393 credits can be applied to graduation.

**EVENT 423: International Meetings and Conferences Management**

(3-0) Cr. 3.

*Prereq: EVENT 171; EVENT 371*

A comprehensive understanding of the strategies, procedures and nuances of planning and executing multinational and multicultural meetings, expositions, conventions or events held outside of the United States. The international aspects that will be covered include planning, budgeting, logistics, venue selection, risk management, and cross-cultural understanding.

Meets International Perspectives Requirement.

**EVENT 471: Special Events Coordination**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; EVENT 371; Junior classification*

Advanced application of event management - hands-on special event planning experience, an understanding of how events are managed, and confidence in the researching, planning, coordinating, marketing, management, financial management, wayfinding and evaluation of special events.

**EVENT 485: Event Production**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 371; Event Management major*

Event management production and design elements, including experience design, stakeholder relations, risk management, fundraising and sponsorship, promotion, developing objectives, and evaluation and assessment.



**EVENT 486: Advanced Event Production**

(0-6) Cr. 3. Repeatable, maximum of 6 credits. F.

*Prereq: EVENT 371; EVENT 485; Event Management major*

Advanced application event management. Provide leadership and direction for production of an event including vendor and stakeholder relations, budget management, publicity, advertising, choreography, staging, lighting, and food. Maximum of 6 credits may be applied toward graduation. Maximum of 6 credits can be applied toward graduation

**EVENT 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Sections B-D: Program approval; Section H: Full membership in Honors Program*

Independent study.

**EVENT 490B: Independent Study: Conferences**

Cr. arr. Repeatable.

*Prereq: Program approval*

Independent study.

**EVENT 490C: Independent Study: Special Events**

Cr. arr. Repeatable.

*Prereq: Program approval.*

Independent study.

**EVENT 490D: Independent Study: Event Management**

Cr. arr. Repeatable.

*Prereq: Sections B-D: Program approval; Section H: Full membership in Honors Program*

Independent study.

**Courses primarily for graduate students, open to qualified undergraduates:**

**EVENT 531: Event Business Research Essentials**

(3-0) Cr. 3. F.

*Prereq: permission of instructor*

Event leaders must understand how to apply the most appropriate tools and methods to accomplish the event's business objectives. Exploration of the knowledge and skills necessary to address the rapidly growing demand for a systematic approach to event business research and its application to strategic decision making. Examination of case studies, primary and secondary sources of information, as well as research design, measurement, sampling, data collection, processing, analysis, and interpretation.

**EVENT 561: Advanced Topics in Event Management**

(3-0) Cr. 3. S.

*Prereq: permission of instructor*

Advanced meeting and event planning topics including event strategy, event risk and security management, event financial management, event design, event project management, and event tourism strategy.

**EVENT 577: Advanced Social Media Marketing in Event Management**

(3-0) Cr. 3. F.

*Prereq: permission of instructor*

Project-based course that includes analyzing relevant literature in social media and developing, implementing, and assessing an integrated social media marketing strategy in the event planning business marketing plan. Perspective on digital/social/mobile marketing to appreciate its true value to consumers, to managers, and to other corporate stakeholders.

**EVENT 578: Advanced Event Sustainability Management**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: permission of instructor*

Examination of the critical area of sustainability and the reasons why event businesses must prioritize it if they are to succeed. Many people mistakenly believe that sustainability is synonymous with 'green' and is solely concerned with the environment. This is incorrect, as true business sustainability considers both societal and economic factors, as it encompasses both the impact on societal stakeholders (consumers and employees) and the profit required to sustain a business. Examine how contemporary human societies can adapt to global change and build healthier systems.

**EVENT 590: Special Topics**

Cr. 3. F.S.

*Prereq: Graduate level standing; permission of instructor*

Topics in event management.

**EVENT 599: Creative Component**

(3-0) Cr. 3.

*Prereq: Graduate level standing*

Creative component as arranged with instructor.

**Courses for graduate students:**

**EVENT 634: Theory and Research Seminar in Event Management**

(3-0) Cr. 3. SS.

*Prereq: STAT 401 or a graduate level course in statistics or by permission of instructor*

Analysis and application of theories and research methodologies in event management and is designed to strengthen students' analytical and critical perspectives to evaluate event management research. Multidisciplinary approach to the areas of sports events, festivals and fairs, conventions and tradeshow, mega events, and event tourism.

**Courses primarily for undergraduates:****HSP M 101: Introduction to the Hospitality Industry**

(3-0) Cr. 3. F.S.

Introduction to the foodservice, lodging, and tourism components of the hospitality industry. Background information, current issues, and future challenges in various segments of the industry.

**HSP M 133: Food Safety Certification**

(1-0) Cr. 1. F.S.

Introduction to safety and sanitation principles in foodservice operations. Characteristics of food, supplies, and equipment as related to quality, sanitation, and safety are discussed. Application of sanitation principles in restaurants are covered as well. Students must pass a National Sanitation Certification Examination to receive credit. Offered on a satisfactory-fail basis only.

**HSP M 201: Casino Management I**

(3-0) Cr. 3. F.

An overview of the casino gaming industry. Emphasis will be placed on examination of the history and development of gaming, casino operations, casino games, marketing of the core gaming products, and social and economic impacts of the gaming industry.

**HSP M 225: Introduction to Food Service Operations**

(3-0) Cr. 3. S.

Introduction to food service operations within the hospitality and event industry. Management concepts, distinct features, sustainability, current issues, and trends.

**HSP M 230: Introduction to Hospitality Performance Analysis**

(3-0) Cr. 3. F.S.

Introduction to Uniform Systems of Accounts for hospitality industry, profitability, income statements, budgeting, managing cash, accounts receivable and payable, costs control, pricing, and evaluation related to restaurant, lodging, and club industry. Preparation for a hospitality accounting certification exam.

**HSP M 233: Hospitality Sanitation and Safety**

(3-0) Cr. 3. F.S.

Sanitation and safety principles in hospitality operations. Issues impacting consumers and operators.

**HSP M 248: Introduction to Senior Living Management**

(3-0) Cr. 3. F.

Survey course provides a comprehensive overview of the history, current issues, and future trends of the senior living industry. Basics about major aspects of senior living management.

**HSP M 260: Global Tourism Management**

(3-0) Cr. 3. F.S.

Overview of the global tourism industry: hospitality and related services, destination/ attractions, tourist behaviors, and destination marketing. Introduction to destination mix, socio-economic and cultural impacts of tourism, destination organizations, tourist motivations, destination image, marketing, promotions, tourism distribution system, and the future of tourism.

Meets International Perspectives Requirement.

**HSP M 280: Non-Alcoholic Beverages and Café Operations**

(3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in HSP M 133*

Advanced knowledge, preparation, and service of non-alcoholic beverages applied for café operations.

**HSP M 289: Contemporary Club Management**

(3-0) Cr. 3. S.

*Prereq: HSP M 101*

Organization and management of private clubs including city, country, and other recreational and social clubs. Field trip may be required.

**HSP M 290: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshman or Sophomore classification. Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. Maximum of 9 credits combined of HSP M 290 and HSP M 490 can be applied to graduation.

**HSP M 301: Hospitality Revenue Management**

(3-0) Cr. 3. F.

An overview of the revenue management in the lodging and food service industry will be provided. Emphasis will be placed on the application of analytical and forecasting techniques to formulate and implement pricing strategies in responses to daily operation complexities.

**HSP M 315: Hospitality Law**

(3-0) Cr. 3. S.

Laws relating to ownership and operation of hospitality organizations. The duties and rights of both hospitality business operators and customers. Legal implications of various managerial decisions.

**HSP M 320: Attractions and Amusement Park Administration**

(3-0) Cr. 3. S.

*Prereq: HSP M 101 or permission of instructor*

Examination of current issues in the attractions and amusement park industry. Emphasis will be placed on development and design along with the functional departments of modern amusement parks and themed attractions.

**HSP M 333: Hospitality Operations Cost Controls**

(3-0) Cr. 3. F.

*Prereq: (Credit or concurrent enrollment in HSP M 380 and HSP M 380L); 3 credits MATH; HSP M 230*

Introduction to revenue and cost systems in the hospitality industry. Application of principles related to procurement, production, and inventory controls.

**HSP M 352: Lodging Operations Management I**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in HSP M 101*

Introduction to functional department activities and current issues of lodging organizations with emphasis on front office operations and guest services including reservation activities, forecasting, and auditing exercises.

**HSP M 358: Economics for Senior Living Management**

(3-0) Cr. 3. F.

*Prereq: HSP M 248*

Overview of supply and demand, product/service development, consumption, and financials of the senior living industry from a management perspective.

**HSP M 380: Food Production Management**

(3-0) Cr. 3. F.S.

*Prereq: HSP M 133 or 2 cr MICRO; FS HN 111 or FS HN 214; FS HN 115 or FS HN 215; at least junior classification; enrollment in HSP M 380L*

Principles of and procedures used in food production management including menu planning, costing, work methods, food production systems, quality control, and service.

**HSP M 380L: Food Production Management Experience**

(1-6) Cr. 3. F.S.

*Prereq: HSP M 133 or 2 cr MICRO; FS HN 111 or FS HN 214; FS HN 115 or FS HN 215; at least junior classification; enrollment in HSP M 380*

Application of food production and service management principles and procedures in the program's foodservice operation. Filed trip.

**HSP M 383: Wine and Spirits in Hospitality Management**

(2-0) Cr. 2. F.S.

*Prereq: Must be at least 21 years old*

Introduction to history and methods of production for a variety of wines and spirits. Beverage tasting and sensory analysis; product knowledge; service techniques; sales; and alcohol service related to the hospitality industry. Field trip.

**HSP M 383L: Wine, Spirits, and Mixology Laboratory in Hospitality Management**

(1-2) Cr. 2. F.S.

*Prereq: Must be at least 21 years old.*

The application of the management principles and procedures related to the sale and service of alcohol, specialty beverages, and cocktails served in the beverage and hospitality industry. Beverage tasting and sensory analysis of products commonly served in the beverage industry. Field trip.

**HSP M 385: Beer and Brewed Beverages in Hospitality Management**

(2-0) Cr. 1. F.S.

*Prereq: Must be at least 21 years old*

Introduction to history and methods of production for a variety of beer, cider, perry, mead, sake and other brewed alcoholic beverages. Beverage tasting and sensory analysis; product knowledge; and service techniques related to the beverage and hospitality industry. Field trip. 8-week course.

**HSP M 391: Foodservice Systems Management I**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in HSP M 380 and HSP M 380L*

Principles and techniques related to basic management, leadership, and human resource management of foodservices in health care and other on-site foodservice settings. Food safety and sanitation for on-site foodservice operations. Credit for either HSP M 391 or AESHM 287 and AESHM 438 may count toward graduation. Not accepted for credit toward a major in Hospitality Management.

**HSP M 392: Foodservice Systems Management II**

(3-0) Cr. 3. S.

*Prereq: HSP M 391*

Introduction to cost control in foodservice operations: procedures for controlling food and labor variable costs. Application of principles related to food product selection, specification, purchase, and storage in health care and other onsite operations. Interpretation and application of financial records. Credit for either HSP M 392 or HSP M 233 and HSP M 333 may count toward graduation. Not accepted for credit toward a major in Hospitality Management.

**HSP M 393: Hospitality Management Industry Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: HSP M major; Junior or Senior Classification; Permission of Instructor*  
Intensive 2 to 8 week workshop exploration. Topics vary each time offered. Maximum of 6 credits of HSPM 393 can be applied toward graduation.

**HSP M 420: Fairs and Festivals Management**

(3-0) Cr. 3.

*Prereq: HSP M 320*

Examine current issues within fairs and festivals. Emphasis placed on the evolution of exhibitions to modern day fairs and festivals, along with the processes necessary for operating fairs and festivals.

**HSP M 433: Hospitality Financial Management**

(3-0) Cr. 3. S.

*Prereq: ACCT 284; ECON 101; HSP M 333; credit or concurrent enrollment in STAT 101*

Fundamental concepts and issues in hospitality finance and investment. Application of financial statement analysis, accounting ratio analysis, and financial instruments in management decision-making.

**HSP M 437: Hospitality Technology Applications**

(3-0) Cr. 3. F.

*Prereq: HSP M 101*

Introduction to hospitality technology. Emphasis will be placed on basic computer software and hardware components, property managements, point-of-sales systems; customer relationship management, selecting and purchasing computer systems, electronic distribution systems, and communication networks.

**HSP M 439: Advanced Hospitality Human Resource Management**

(3-0) Cr. 3. F.

*Prereq: AESHM 238*

Emphasis on development of management personnel in hospitality organizations. Case studies.

**HSP M 452: Lodging Operations Management II**

(3-0) Cr. 3. S.

*Prereq: HSP M 352*

Development of business plan and evaluation of business performance in a simulated environment. Operational decision making practices by applying concepts of management, operations, marketing, and finance for a computer-mediated environment.

**HSP M 455: Strategic Management in Hospitality**

(3-0) Cr. 3. S.

*Prereq: AESHM 238 and AESHM 340; credit or concurrent enrollment in HSP M 433*

Introduction to strategic management principles and practices with an application of human resources, operations, marketing, and financial management concepts. Case studies.

**HSP M 470: Supervised Professional Internship**

Cr. 3. Repeatable. F.S.SS.

*Prereq: AESHM 270, AESHM 211, 9 credits in HSP M, and minimum 2.0 GPA; permission by application; junior or senior classification; employer/experience should be different than employer/experience used for AESHM 170 and AESHM 270*

Supervised work experience with a cooperating firm or organization, documentation of experience, and completion of an internship project. Coursework includes weekly self-reflection and topics related to current issues and career advancement. Employer/experience should be different than employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, AESHM 270, and HSP M 470 may be applied toward graduation.

**HSP M 487: Fine Dining Management**

(Dual-listed with HSP M 587). (2-3) Cr. 3. F.

*Prereq: HSP M 380, HSP M 380L, and HSP M 133, or ServSafe(r) Certification*

Exploration of the historical and cultural development of the world food table. Creative experiences with U.S. regional and international foods. Application of management and financial principles in food preparation and service in fine dining settings.

Meets International Perspectives Requirement.

**HSP M 489: Issues in Food Safety**

(Cross-listed with AN S, FS HN, VDPAM). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**HSP M 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program***HSP M 490B: Independent Study: Hospitality Management**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval*

Independent Study in Hospitality Management.

**HSP M 490D: Independent Study: Lodging Operations**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program***HSP M 490E: Independent Study: Foodservice Operations**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**HSP M 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**Courses primarily for graduate students, open to qualified undergraduates:**

**HSP M 505: Hospitality Management Scholarship and Applications**

(0-1) Cr. 1-3. Repeatable. F.SS.

Focus on teaching and research scholarship involving the hospitality industry.

**HSP M 506: Research Seminar in Hospitality Management**

(0-1) Cr. 1. Repeatable. S.

Focus on current research in hospitality industry. Discuss research designs and methods commonly used in hospitality management research; Introduce research proposal development procedures.

**HSP M 533: Financial Decision Making in Hospitality Organizations**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Concepts of financial management applied to strategic decision making.

**HSP M 538: Human Resources Development in Hospitality Organizations**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: AESHM 238*

Theories of human resources management. Practices and principles related to development of management personnel.

**HSP M 540: Strategic Marketing**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AESHM 340*

Application of marketing principles in developing effective marketing strategies for hospitality, apparel, and retail organizations. Evaluation of multi-dimensional marketing functions in hospitality organizations.

**HSP M 555: Strategic Management in Hospitality Organizations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Courses in MKT, FIN, MGMT, and HSP M. Permission of instructor*

Strategic management process as a planning and decision-making framework; integration of human resources, operations, marketing, and financial management concepts.

**HSP M 560: Tourism Management and Tourist Behavior**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HSP M 260 or equivalent*

Tourism theories and research. Overview of tourism industry, tourism theories, methods, and current issues in destination marketing and management and travel behavior. Evaluation of tourism and destination research.

**HSP M 587: Fine Dining Management**

(Dual-listed with HSP M 487). (2-3) Cr. 3. F.

*Prereq: HSP M 380, HSP M 380L, and HSP M 133, or ServSafe(r) Certification*

Exploration of the historical and cultural development of the world food table. Creative experiences with U.S. regional and international foods.

Application of management and financial principles in food preparation and service in fine dining settings.

Meets International Perspectives Requirement.

**HSP M 590: Special Topics**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process*

Topics in hospitality management.

**HSP M 590B: Special Topics: Hospitality Management**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590C: Special Topics: Tourism**

Cr. arr. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: 9 credits in HSP M at 400 level or above; application process*

Special topics in tourism.

**HSP M 590D: Special Topics: Lodging Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590E: Special Topics: Commercial/Retail Foodservice Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590F: Special Topics: Onsite Foodservice Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590G: Special Topics: Event Management**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in HSP M or EVENT at 500 level or above; application process*

Special Topics in Event Management. Only 6 credits of HSP M 590G can be applied toward graduation.

**HSP M 599: Creative Component**

Cr. arr.

Creative component as arranged with instructor.

**Courses for graduate students:**



**HSP M 604: Professional Writing**

(2-0) Cr. 2. S.SS.

*Prereq: Enrollment in PhD program*

Development of professional written communication with emphasis on abstracts, proposals, and manuscripts.

**HSP M 608: Administrative Problems**

Cr. arr. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of instructor; enrollment in PhD program*

Advanced administrative problems; case studies in foodservice and lodging organizations.

**HSP M 633: Advanced Hospitality Financial Management**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 433; Enrollment in PhD program*

Theories and research in financial management with emphasis on financial performance and financing decisions.

**HSP M 638: Advanced Human Resources Management in Hospitality Organizations**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 538; Enrollment in PhD program*

Research in human resources management with an emphasis on organization or unit administration.

**HSP M 640: Seminar on Marketing Thoughts**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 540; STAT 401. Enrollment in PhD program*

Conceptual and theoretical development of marketing strategies. Analytical and critical review of marketing research and industry practices.

**HSP M 652: Advanced Lodging Operations**

(3-0) Cr. 3. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Enrollment in PhD program*

Analysis and applications of concepts and theories of operations research for lodging operations.

**HSP M 660: Research Seminar in Tourism Management**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in PhD program*

Advanced graduate course on tourism and destination theories and research. Analysis and application of theories, research findings, and research methods in tourism and destination management.

**HSP M 680: Analysis of Research in Foodservice Operations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in PhD program*

Analysis and application of theories, research, and research methods in foodservice operations.

**HSP M 690: Advanced Topics**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690B: Advanced Topics: Hospitality Management**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690C: Advanced Topics: Tourism**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690D: Advanced Topics: Lodging Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690E: Advanced Topics: Commercial/Retail Foodservice Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690F: Advanced Topics: Onsite Foodservice Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690G: Advanced Topics: Event Management**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in event management and hospitality management.

**HSP M 699: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in PhD program*

Research.

## Apparel, Merchandising, and Design

Administered by the Department of Apparel, Events, and Hospitality Management. Leading to the degree bachelor of science.

Total credits required: 123 including a minimum of 18 credits in AMD at Iowa State University for the degree (12 of the 18 credits must be at the 300-400 level). The major in apparel, merchandising, and design provides a broad-based program of study with flexibility in creating program options. Courses are required in general education and the apparel



industry professional core. To complete the program, a student selects a primary option from design, product development and innovation, merchandising and retail analytics, or fashion communication.

Minors and a certificate are available in apparel, merchandising, and design: (a) textile science and product performance or (b) a textile design minor in collaboration with the College of Design; and a merchandising certificate.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. *Communication.* Use clear and effective written, oral, verbal and electronic (WOVE) communication techniques to foster inquiry, collaboration, and engagement in apparel and related industries.
2. *Self-assessment/self-reflection.* Analyze and evaluate one's own knowledge, abilities, and actions relative to professional standards, seek opportunities to grow professionally, and utilize self-assessment and assessment of others to foster psychological, cognitive, social and emotional well-being.
3. *Critical thinking.* Understand fundamental concepts of apparel, merchandising, and design and apply critical thinking to solve problems from personal, scholarly, and professional perspectives.
4. *Ethics, Diversity, and Social Responsibility.* Demonstrate leadership and social justice to improve quality of life for global citizens and encourage socially responsible decision-making for consumers and businesses.

## UNDERGRADUATE STUDY

The program offers study for the degree of Bachelor of Science with a major in apparel, merchandising, and design (AMD). The program offers students a broad understanding of textile and apparel products, merchandising and marketing strategies, technical and creative design, product development, production processes, and business practices leading to a wide range of careers at state, national, and international levels in business and industry. Courses in the program provide scientific, technical, and humanistic knowledge about textiles, apparel, and related products basic to career preparation. Courses also provide knowledge applicable to the development and use of apparel and textile products by individuals, families, and institutions. The program provides a foundation for graduate study. Graduates understand the production, distribution, and use of textiles and apparel, aesthetic expression, and communication. They are prepared to plan, develop, source and present textile and apparel products to meet the needs of consumers. Students understand the issues involved in textile and apparel production and marketing, both nationally and internationally.

The AMD major provides a broad-based program of study with flexibility in creating an individualized program. To complete the program, a student combines general education, AMD core classes, and a structure of

focused courses to form an option in: (a) creative and technical design, (b) fashion communication, (c) product development and innovation, or (d) merchandising and retail analytics.

An option in *creative and technical design* is appropriate for those interested in the aesthetic and creative aspects of design, technical design, costuming, textile design, and product development. The *fashion communications* option prepares students for the development and delivery of visual, written, and oral communication. Career opportunities are in visual merchandising, styling, fashion influencing, social media, and communication. An option in *product development and innovation* is appropriate for those interested in developing innovative products for special markets including accessories, footwear, performance wear, smart textiles, functional apparel, and soft-goods for home. Career opportunities include designer, materials testing, quality assurance, and technical design. An option in *merchandising and retail analytics* prepares students for the planning, promotion, and presentation of market-oriented product lines and events. Career opportunities are in buying, promotion, sales, product development, branding, and management in both manufacturing and retailing sectors with a focus on the textile and apparel industry.

For additional courses of interest, see Apparel, Events, and Hospitality Management.

## GRADE POINT REQUIREMENT

All students majoring in apparel, merchandising, and design are required to earn a C- or better in all AESHM and AMD courses applied toward the degree, including transfer credits.

## COMMUNICATION PROFICIENCY REQUIREMENT

Undergraduate English proficiency is certified when the student has received a grade of C or better in ENGL 150 Critical Thinking and Communication, and ENGL 250 Written, Oral, Visual, and Electronic Composition.

## Curriculum in Apparel, Merchandising, and Design

Administered by the Department of Apparel, Events, and Hospitality Management (AESHM). Leading to the degree bachelor of science.

Total credits required: 123, including a minimum of 18 credits in AMD at Iowa State University for the degree (12 of the 18 credits must be at the 300-400 level). Leads to the degree Bachelor of Science. Administered by the AESHM Department. All students majoring in Apparel, Merchandising, and Design (AMD) are required to earn a C- or better in all AMD, AESHM, EVENT, and HSP M courses applied toward the degree, including transfer credits. All students majoring in Apparel, Merchandising, and Design (AMD) are required to earn a C or better in ENGL 150 and ENGL 250.

No courses may be applied to more than one degree requirement

except those used to meet US Diversity and International Perspective requirements.

#### Cr. Degree Requirements

### Communications Skills

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
Select one (1) course:		3
COMST 210	Communication and U.S. Diversity	
COMST 214	Professional Communication	
COMST 218	Conflict Management	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>10</b>

### Mathematics and Science Disciplines

Mathematics (MATH 150 recommended for merchandising)		3
Select from natural sciences. Creative and technical design, product development, and product innovation options must take CHEM 163 and CHEM 163L.		3-5
Select one (1) course:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
STAT 226	Introduction to Business Statistics I	
<b>Total Credits</b>		<b>9-12</b>

### Social Sciences and Humanities

ECON 101	Principles of Microeconomics	3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	3
A M D 356	Euro-American Dress History: Mid-19th Century to the Present	3
History/Art History (creative and tech design: ART H Required)		3
Select one (1) course:		3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	
A M D 362	Cultural Perspectives of Global Dress	
A M D 366X	History of Menswear	
A M D 458	Queer Fashions: History, Culture, and the Industry	
A M D 462X	Black Lives Matter: Fashion, Liberation, and the Fight for Freedom	
College of Liberal Arts & Sciences list of Arts and Humanities courses		
College of Liberal Arts & Sciences list of Social Science courses		
Total Credits		15

### AESHM Professional Development

AESHM 111	Professional Development for AESHM	1
AESHM 111L	AESHM Program Orientation and Learning Community	1
AESHM 211	Leadership Experiences and Development (LEAD)	3
AESHM 311N	Seminar on Careers and Internships: Apparel, Merchandising, and Design	1
AESHM 470MX or AESHM 470N	Supervised Professional Internship: Apparel (Out-of-state) or Supervised Professional Internship: Apparel	3-6
And select three (3) credits from:		
AESHM 170N	Supervised Work Experience I: Apparel	
AESHM 180N	First Year Student Field Study: Apparel, Merchandising, and Design	
AESHM 280	Orientation to U.S. Field Study	
AESHM 281	Orientation to International Field Study	
AESHM 270N	Supervised Work Experience II: Apparel	
AESHM 287	Principles of Management in Human Sciences	
AESHM 380N	U.S. Field Study: Apparel, Merchandising, and Design	
AESHM 381N	International Field Study: Apparel, Merchandising, and Design	
AESHM 421	Developing Global Leadership: Maximizing Human Potential	
<b>Total Credits</b>		<b>9-12</b>

### AMD Integrated Core

A M D 131	Fashion Products and Markets	3
A M D 204	Textile Science	4
A M D 210	Computer Applications in Digital Design	3
A M D 231	Product Development and Manufacturing	4
A M D 245	Aesthetics and Brand Image	3
A M D 275	Retail Merchandising	3
A M D 372	Sourcing and Global Issues	3
COM S 113	Introduction to Spreadsheets and Databases	3
<b>Total Credits</b>		<b>26</b>

### Primary Options

Select one AMD professional primary option from the following four choices:

#### Creative and Technical Design Primary Option

A M D 121	Apparel Assembly Processes	4
A M D 178	Introduction to Apparel Design Studio	3
A M D 225	Patternmaking I: Drafting and Flat Pattern	3

A M D 278	Fashion Illustration	3
A M D 310	Computer Aided Apparel Patternmaking	3
A M D 321	Computer Integrated Textile and Fashion Design	3
A M D 325	Patternmaking II: Draping	3
A M D 329	Digital Textile Printing for Apparel Design	3
A M D 415	Technical Design Processes	3
A M D 495	Senior Design Studio	3
Select one (1) course:		3
A M D 305	Quality Assurance of Textiles and Apparel	
A M D 404	Innovative Textiles	
A M D 431	Apparel Production Management	
Select one (1) course:		3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	
A M D 362	Cultural Perspectives of Global Dress	
A M D 366X	History of Menswear	
A M D 458	Queer Fashions: History, Culture, and the Industry	
A M D 462X	Black Lives Matter: Fashion, Liberation, and the Fight for Freedom	
Select two (2) courses:		6
AMD, AESHM, THTRE, ART IS, DSGN, or DSN S.		
This category can be used to fulfill approved double major or minor requirements		

**Total Credits** 43

### Product Development for Apparel and Soft Goods Primary Option

A M D 121	Apparel Assembly Processes	4
A M D 178	Introduction to Apparel Design Studio	3
A M D 225	Patternmaking I: Drafting and Flat Pattern	3
or A M D 226X	3D Designing and Patternmaking for Soft Good Product Development	
A M D 305	Quality Assurance of Textiles and Apparel	3
A M D 310	Computer Aided Apparel Patternmaking	3
A M D 321	Computer Integrated Textile and Fashion Design	3
A M D 404	Innovative Textiles	3
A M D 415	Technical Design Processes	3
A M D 426	Creative Design Processes	3
A M D 431	Apparel Production Management	3
A M D 496	Soft-Goods Product Development and Prototyping	3
SCM 301	Supply Chain Management	3

**Total Credits** 37

### Merchandising and Retail Analytics Primary Option

ACCT 284	Financial Accounting	3
AESHM 340	Hospitality and Apparel Marketing Strategies	3
or MKT 340	Principles of Marketing	
AESHM 474	Entrepreneurship in Human Sciences	3
A M D 375	Omni-Channel Retailing	3
A M D 376	Merchandise Planning and Buying	4
A M D 377	Visual Presentation and Promotions	3
A M D 388	Trend Forecasting	3
A M D 467	Consumer Studies in Apparel and Fashion Products	3
A M D 475	Retail Analytics	3
DS 201	Introduction to Data Science	3
Select four (4) courses from:		12-14

AESHM or A M D

This category can be used to fulfill approved double major or minor requirements

**Total Credits** 43-45

### Fashion Communication Primary Option

ACCT 284	Financial Accounting	2-3
or AESHM 175N	Financial Applications for Retail and Hospitality Industries: Retail Merchandising	
AESHM 340	Hospitality and Apparel Marketing Strategies	3
or MKT 340	Principles of Marketing	
AESHM 474	Entrepreneurship in Human Sciences	3
A M D 288	Styling	3
A M D 376	Merchandise Planning and Buying	4
A M D 377	Visual Presentation and Promotions	3
A M D 388	Trend Forecasting	3
EVENT 171	Introduction to Event Management	3
EVENT 277	Introduction to Digital Promotion in Event Management	3

Select one (1) course from: 3

AESHM or A M D

This category can be used to fulfill approved double major requirements, including ADVRT, COM ST, D S, ENTSP, EVENT, JL MC, MKT, and PR

Select two (2) courses from: 6

Approved minor or double major, including ADVRT, COM ST, D S, EVENT, JL MC, PR, or Technical Communications.

**Total Credits** 36-37

Apparel Merchandising, Design B.S. - Creative and Technical Design  
Primary Option

**Freshman**

Fall	Credits	Spring	Credits
ENGL 150		3 ENGL 250	3
A M D 131 (Fall only)		3 MATH 140	3
A M D 165		3 A M D 121	4
A M D 178		3 A M D 204	4
AESHM 111		1 A M D 206	R
AESHM 111L		1 A M D 245	3
LIB 160		1	
<b>15</b>		<b>17</b>	

**Sophomore**

Fall	Credits	Spring	Credits
A M D 210		3 A M D 225	3
A M D 275		3 AESHM 211	3
A M D 278		3 ART H 281	3
Humanities & Social Science Choice		3 COM S 113	3
CHEM 163		4 ECON 101	3
CHEM 163L		1	
<b>17</b>		<b>15</b>	

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
A M D 231		4 A M D 310		3 AESHM 470N	5
A M D 321		3 A M D 329	3		
A M D 325		3 A M D 356	3		
AESHM 311N		1 AESHM 280	R		
STAT 101		4 AESHM 380N	3		
		Speech Choice	3		
<b>15</b>		<b>15</b>		<b>5</b>	

**Senior**

Fall	Credits	Spring	Credits
Creative & Technical Design Option Elective 1		3 Creative & Technical Design Option Elective 2	3

A M D 372	3 A M D 431 (Spring only)	3
A M D 415	3 A M D 362 (Spring only)	3
A M D 495	3 Elective	3
<b>12</b>		<b>12</b>

**Total Credits: 123**

Apparel Merchandising, Design B.S. - Merchandising Retail Analytics  
Primary Option

**Freshman**

Fall	Credits	Spring	Credits
ENGL 150		3 ENGL 250	3
A M D 131 (Fall only)		3 A M D 275	3
A M D 165		3 COM S 113	3
AESHM 111		1 ECON 101	3
AESHM 111L		1 Merchandising Elective 1	3
LIB 160		1	
Math Choice		3	
<b>15</b>		<b>15</b>	

**Sophomore**

Fall	Credits	Spring	Credits
A M D 204		4 A M D 376	4
A M D 210		3 A M D 356	3
A M D 245		3 AESHM 211	3
ACCT 284		3 DS 201	3
History Choice		3 Select one (1) class from: AESHM 340 MKT 340	3
<b>16</b>		<b>16</b>	

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
A M D 231		4 A M D 375 (Spring only)		3 AESHM 470N	4
A M D 377		3 A M D 475	3		
A M D 388		3 AESHM 280	R		

AESHM 311N	1 AESHM 380N	3
Merchandising	3 Merchandising	3
Option	Option	
Elective 2	Elective 3	
Science	3 STAT 101	4
Choice		
	<b>17</b>	<b>16</b>

**Senior**

Fall	Credits	Spring	Credits
A M D 372	3	AESHM 474	3
A M D 467	3	Merchandising	3
(Fall only)		Elective 4	
Humanities	3	Speech	3
or Social		Choice	
Science			
Elective			
Elective	3	Elective	3
	<b>12</b>	<b>12</b>	

**Total Credits: 123**

Apparel Merchandising, Design B.S. - Product Development for Apparel and Soft Goods Primary Option

**Freshman**

Fall	Credits	Spring	Credits
ENGL 150	3	ENGL 250	3
A M D 131	3	MATH 140	3
A M D 165	3	A M D 121	4
A M D 178	3	A M D 204	4
AESHM 111	1	A M D 206	R
AESHM 111L	1	A M D 245	3
LIB 160	1		
	<b>15</b>	<b>17</b>	

**Sophomore**

Fall	Credits	Spring	Credits
A M D 210	3	A M D 231	4
A M D 275	3	A M D 226X	3
DSN S 131	4	AESHM 211	3
ECON 101	3	AESHM 311N	1
Social	3	CHEM 163	4
Science or			
Humanities			
Choice		CHEM 163L	1
	<b>16</b>	<b>16</b>	

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
A M D 376	4	A M D 321		3 AESHM 470N	3
AESHM 280		R A M D 356		3	
		(Spring only)			
AESHM 380N	3	A M D 372		3	
COM S 113	3	A M D 404		3	
		(Spring only)			
Product	3	History or		3	
Development		Art History			
and		Choice			
Innovation					
Elective 1					
STAT 101	4				
	<b>17</b>		<b>15</b>		<b>3</b>

**Senior**

Fall	Credits	Spring	Credits
A M D 305	3	A M D 431	3
(Fall only)		(Spring only)	
Product	3	A M D 496	3
Development		(Spring only)	
and			
Innovation			
Elective 2			
Speech	3	Product	3
Choice		Development	
		and	
		Innovation	
		Elective 3	
Elective	3	Elective	3
	<b>12</b>	<b>12</b>	

**Total Credits: 123**

Apparel, Merchandising, and Design, B.S. – Product Management Sourcing Primary Option

**Freshman**

Fall	Credits	Spring	Credits
ENGL 150	3	ENGL 250	3
A M D 131	3	A M D 121	4
(Fall only)			
A M D 165	3	A M D 204	4
A M D 178	3	A M D 206	R

AESHM 111	1 A M D 245	3
AESHM 111L	1 MATH 140	3
LIB 160	1	
<b>15</b>		<b>17</b>

**Sophomore**

Fall	Credits	Spring	Credits	
A M D 210		3 ACCT 284	3	
A M D 275		3 A M D 231	4	
AESHM 211		3 A M D 226X	3	
CHEM 163		4 AESHM 280	R	
CHEM 163L		1 AESHM 380N	3	
ECON 101		3 AESHM 311N	1	
		Social	3	
		Science or Humanities Choice		
<b>17</b>		<b>17</b>		

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
A M D 376		4 A M D 356 (Spring only)		3 AESHM 470N	5
COM S 113		3 A M D 372	3		
Select one (1) class from:		3 Professional Development Elective	3		
AESHM 340		Speech Choice	3		
MKT 340					
STAT 101	4				
History Choice	3				
<b>17</b>		<b>12</b>		<b>5</b>	

**Senior**

Fall	Credits	Spring	Credits	
A M D 305		3 A M D 431 (Spring only)	3	
A M D 415		3 A M D 496 (Spring only)	3	
A M D 467	3	Elective	3	

Elective	3	SCM 301	3
<b>12</b>		<b>12</b>	

**Total Credits: 124**

Apparel, Merchandising, and Design, B.S. – Fashion Communications  
Primary Option

**Freshman**

Fall	Credits	Spring	Credits	
ENGL 150		3 ENGL 250	3	
A M D 131 (Fall only)		3 A M D 210	3	
A M D 165		3 A M D 245	3	
AESHM 111		1 EVENT 171	3	
AESHM 111L		1 Fashion Communications Elective 1	3	
LIB 160	1			
Social	3			
Science or Humanities Choice				
<b>15</b>		<b>15</b>		

**Sophomore**

Fall	Credits	Spring	Credits	
A M D 204		4 ACCT 284	3	
A M D 275		3 A M D 376	4	
Select one (1) class from:		3 AESHM 211	3	
MATH 104		ECON 101	3	
MATH 105		EVENT 277	3	
MATH 140				
MATH 150				
COM S 113	3			
Minor	3			
Class 1 (dd in FC electives)				
<b>16</b>		<b>16</b>		

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
A M D 231		4 A M D 356		3 AESHM 470N	3
A M D 288		3 A M D 377	3		
AESHM 311N		1 A M D 388	3		



Select one (1) class from:	3 AESHM 280	R	
AESHM 340	AESHM 380N	3	
MKT 340	STAT 101	4	
Science Choice Minor Class 2 (dd in FC electives)	3		
	3		
	17	16	3
<b>Senior</b>			
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>
A M D 372	3 AESHM 474	3	
Speech Choice Minor Class 3 Minor Class 4 Elective	3 History Choice 3 Minor Class 5 3 Elective 2	3  3  3	
	14	12	

Total Credits: 124

Apparel, Merchandising, and Design Minor

A minor in Apparel, Merchandising, and Design requires (15-17 cr.) of the following:

Select from:	3
A M D 121	Apparel Assembly Processes
A M D 131	Fashion Products and Markets
A M D 165	Dress, Appearance, and Diversity in U.S. Society
A M D 178	Introduction to Apparel Design Studio
Select from:	3-4
A M D 204	Textile Science
Select from:	3-4
A M D 231	Product Development and Manufacturing
A M D 245	Aesthetics and Brand Image
A M D 275	Retail Merchandising
A M D 288	Styling
300-400 level at Iowa State University in A M D or approved AESHM	6
AESHM 340	Hospitality and Apparel Marketing Strategies
or MKT 340	Principles of Marketing

AESHM 342	Aesthetics of Consumer Experience
AESHM 470N	Supervised Professional Internship: Apparel
AESHM 472	Fashion Show Management
AESHM 474	Entrepreneurship in Human Sciences
AESHM 476CX	Entrepreneurship Studio: Creating an Online Business
AESHM 499X	Research, Seminar, or Senior Project
A M D 305	Quality Assurance of Textiles and Apparel
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century
A M D 356	Euro-American Dress History: Mid-19th Century to the Present
A M D 362	Cultural Perspectives of Global Dress
A M D 372	Sourcing and Global Issues
A M D 375	Omni-Channel Retailing
A M D 376	Merchandise Planning and Buying
A M D 377	Visual Presentation and Promotions
A M D 388	Trend Forecasting
A M D 404	Innovative Textiles
A M D 431	Apparel Production Management
A M D 458	Queer Fashions: History, Culture, and the Industry
A M D 467	Consumer Studies in Apparel and Fashion Products
A M D 475	Retail Analytics
A M D 490	Independent Study
A M D 499	Undergraduate Research

Total Credits 15-17

FASHION, CULTURE, HISTORY, AND SOCIAL JUSTICE MINOR

The Fashion, Culture, History, and Social Justice minor will benefit emerging professionals and future leaders entering the fashion, museum, or other related industries become more critical people in regards to fashion, appearance, clothing, history, and identity. Examples of a few job titles that this minor would benefit include museum curator, collections manager, research associate, chief diversity officer, human resource roles, designers, merchandisers, product developers, and/or marketing managers.

Having an increased awareness of appearances and fashions of individuals historically experiencing oppression and marginalization can aid in societal improvements towards developing a more socially just environment. As students enter the workforce with a social justice background, they can better understand and work with others who are different from them. Additionally, having a better understanding of diverse

consumers could help provide these consumers with the products they desire, in addition to avoiding public diversity issues that are far too common in the fashion industry.

### Learning Outcomes:

- Examine historical, social/psychological, and cultural aspects of fashion, clothing, appearance, and identity with a focus on social justice
- Define social justice, power, privilege, and inequity as it relates to the historical, social/psychological, and cultural aspects of fashion, clothing, appearance, and identity
- Examine power dynamics of diverse communities and cultures and their fashions, clothing, appearance, and identities

### Requirements:

The Fashion, Culture, History, and Social Justice minor can be earned by successfully completing the following for a total of 15 credits. All course prerequisites must be completed prior to taking the course. All minor courses must be taken for a grade.

Required course: 3

A M D 165	Dress, Appearance, and Diversity in U.S. Society
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Select from: 6

A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century
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A M D 366X	History of Menswear
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A M D 356	Euro-American Dress History: Mid-19th Century to the Present
-----------	--

A M D 458	Queer Fashions: History, Culture, and the Industry
-----------	--

AESHM 462X	Black Lives Matter: Fashion, Politics, and Resistance Movements
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Select from: 6

#### African and African American Studies

AF AM 201	Introduction to African American Studies
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AF AM 311	Africa under Colonial Rule
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AF AM 330	Ethnic and Race Relations
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AF AM 334	Africana Religions
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AF AM 347	Studies in African American Literature
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AF AM 350	Women of Color in the U.S
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AF AM 353	History of African Americans I
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AF AM 354	History of African Americans II
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AF AM 473	Civil Rights and Ethnic Power
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#### American Indian Studies

AM IN 201	Native People in American Culture
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AM IN 205	American Indians in the Movies
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AM IN 210	Introduction to American Indian Studies
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AM IN 225	American Indians of Iowa
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AM IN 310	Contemporary Topics in American Indian Studies
-----------	--

AM IN 322	Peoples and Cultures of Native North America
-----------	--

AM IN 332	Current Issues in Native North America
-----------	--

AM IN 346	American Indian Literature
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#### Anthropology

ANTHR 225	American Indians of Iowa
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ANTHR 322	Peoples and Cultures of Native North America
-----------	--

ANTHR 332	Current Issues in Native North America
-----------	--

ANTHR 342	Culture, Sex, and Gender
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#### American Sign Language

ASL 107	Introduction to the Deaf-World
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ASL 275	Topics in Deaf Culture
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ASL 325	Deaf Peoples: Pre-World War II
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#### Apparel, Merchandising, and Design

A M D 362	Cultural Perspectives of Global Dress
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#### Arabic

ARABC 375	Arab Culture
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#### Architecture

ARCH 426	Topics in Native American Architecture
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#### Art History

ART H 382	Art and Architecture of Asia
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ART H 384	Art of Islam
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ART H 494	Women/Gender in Art
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#### Chinese

CHIN 370	Chinese Literature in English Translation
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CHIN 372	Introduction to Chinese Culture
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CHIN 375	China Today
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CHIN 378	Chinese Film and Society
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CHIN 403	Seminar in Chinese Language and Culture
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#### Classical Studies

CL ST 374	Sex, Gender, and Culture in the Ancient Mediterranean World
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#### Economics

ECON 321	Economics of Discrimination
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#### English

ENGL 346	American Indian Literature
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ENGL 347	Studies in African American Literature
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ENGL 352	Queer Literature
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#### History

HIST 207	Chinese Civilization
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HIST 255	Introduction to World History, 1500-Present
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HIST 331	History of the Islamic World to 1800
HIST 336	History of Modern China I
HIST 337	History of Modern China II
HIST 340	History of Latin America I
HIST 341	History of Latin America II
HIST 353	History of African Americans I
HIST 354	History of African Americans II
HIST 371	Mexican American History
HIST 372	Latina/o History
HIST 374	Sex, Gender, and Culture in the Ancient Mediterranean World
HIST 380	History of Women in Science, Technology, and Medicine
HIST 386	History of Women in America
HIST 410	The Holocaust in History
HIST 435	History of the Modern Middle East
HIST 441	History of Modern Mexico and Central America
HIST 457	History of American Sexualities
HIST 465	The American West
HIST 473	Civil Rights and Ethnic Power
Leadership Studies	
LD ST 333	Women, Gender, and Leadership
LD ST 488	Research on Gender and Leadership
Philosophy	
PHIL 235	Ethical Issues in a Diverse Society
PHIL 338	Feminist Philosophy
Political Science	
POL S 385	Women in Politics
Psychology	
PSYCH 346	Psychology of Women
PSYCH 347	U.S. Latino/a Psychology
Religious Studies	
RELIG 210	Religion in America
RELIG 328	Native American Religions (RELIG 333)
RELIG 334	Africana Religions
RELIG 336	Religion, Sex and Gender
RELIG 352	Religions of India
RELIG 358	Islam
Sociology	
SOC 235	Social Problems and American Values
SOC 327	Gender and Sexualities in Society
SOC 330	Ethnic and Race Relations
SOC 331	Social Class and Inequality

SOC 332	The Latino/Latina Experience in U.S. Society
SOC 350	Human Diversity in Agriculture and the Food System
U.S. Latino/a Studies	
US LS 211	Introduction to U.S. Latino/a Studies
US LS 323A	Latin American Anthropology: Violence and Memory
US LS 323B	Latin American Anthropology: Social movements and Democracy
US LS 323C	Latin American Anthropology: Race, Class and Gender
US LS 323D	Latin American Anthropology: Regional Focus
US LS 323E	Latin American Anthropology: Culture and Sport.
US LS 343	Latin American Government and Politics
US LS 347	U.S. Latino/a Psychology
US LS 371	Mexican American History
US LS 372	Latina/o History
US LS 473	Civil Rights and Ethnic Power
Women's and Gender Studies	
WGS 201	Introduction to Women's and Gender Studies
WGS 203	Introduction to Lesbian Communities
WGS 205	Introduction to Queer Studies
WGS 210	Gender and Sexuality in American Pop Culture
WGS 301	International Perspectives on Women and Gender
WGS 320	Ecofeminism
WGS 321	Economics of Discrimination
WGS 323	Gender and Communication
WGS 325	Portrayals of Gender and Sexualities in the Media
WGS 327	Gender and Sexualities in Society
WGS 333	Women, Gender, and Leadership
WGS 336	Religion, Sex and Gender
WGS 338	Feminist Philosophy
WGS 342	Culture, Sex, and Gender
WGS 346	Psychology of Women
WGS 350	Women of Color in the U.S
WGS 352	Queer Literature
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World
WGS 380	History of Women in Science, Technology, and Medicine
WGS 385	Women in Politics
WGS 386	History of Women in America
WGS 435	Gender, Globalization and Development

WGS 457	History of American Sexualities
WGS 488	Research on Gender and Leadership
WGS 494	Women/Gender in Art
World Languages and Cultures	
WLC 352	Religions of India
WLC 358	Islam

## TEXTILE SCIENCE AND PRODUCT PERFORMANCE MINOR

The Textile Science and Product Performance minor is targeted specifically at the scientific, innovative, evaluative, technological, and performative aspects of textiles, and will fulfill industry demands for graduates that can provide answers to complex, interdisciplinary issues linked to textile-centered products. Textiles are utilized daily in: (a) medical procedures, (b) shelters and homes, (c) transportation, (d) physical and psychological protection, (e) physical performance, (f) adornment.

The minor is designed for:

- students in the STEM fields of chemistry, chemical and biological engineering, and materials science and engineering who desire academic experiences and knowledge in another applied product area
- students in the apparel, merchandising, and design, areas who want a focused concentration on textile science and the evaluation of quality and performance of textiles and textile products

### Learning Outcomes

Students who complete the Textile Science and Product Performance minor will meet the following over-arching learning objectives:

- Apply a comprehensive understanding of the characteristics (physical, chemical and structural) of textiles/textile products and the interrelationship of these characteristics to their major discipline
- Engage in interdisciplinary research through the analysis, testing and evaluation of textiles and textile products for sustainable industry and global applications in their major

### Requirements

The Textile Science and Product Performance minor consists of 17 credits, including 14 credits distributed over four required classes. Six of the nine required 300-400 level credits in the minor must be taken at Iowa State University. Nine credits must be isolated to the minor only.

A M D 204	Textile Science	4
A M D 231	Product Development and Manufacturing	4
A M D 305	Quality Assurance of Textiles and Apparel	3

A M D 404	Innovative Textiles	3
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Select one for 3 credits from:

AESHM 470N	Supervised Professional Internship: Apparel
A M D 490A	Independent Study: Textile Science
A M D 499	Undergraduate Research

## Merchandising Certificate

A certificate in Merchandising requires (22 cr.) of the following:

A M D 275	Retail Merchandising	3
A M D 375	Omni-Channel Retailing	3
A M D 376	Merchandise Planning and Buying	4
A M D 475	Retail Analytics	3
Select from:		9
AESHM 287	Principles of Management in Human Sciences	
AESHM 340	Hospitality and Apparel Marketing Strategies	
AESHM 342	Aesthetics of Consumer Experience	
AESHM 470N	Supervised Professional Internship: Apparel	
AESHM 474	Entrepreneurship in Human Sciences	
A M D 165	Dress, Appearance, and Diversity in U.S. Society	
A M D 245	Aesthetics and Brand Image	
A M D 372	Sourcing and Global Issues	
A M D 377	Visual Presentation and Promotions	
A M D 467	Consumer Studies in Apparel and Fashion Products	

<b>Total Credits</b>	<b>22</b>
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The Merchandising Certificate may be earned at the same time as an ISU baccalaureate degree or after the completion of an associate of arts (AA) or associate of science (AS) degree or a baccalaureate degree from any accredited institution.

The AMD program offers a **concurrent B.S. and M.S. degree** that allows students to obtain a B.S. and M.S. degree in apparel, merchandising, and design in **five** years. Application for admission to the Graduate College should be made in the junior year. More information can be found here: <https://aeshm.hs.iastate.edu/graduate-students/graduate-programs/apparel-merchandising-and-design/concurrent-bs-ms/>.

### Graduate Study

The program offers work for the concurrent Bachelor of Science and Master of Science; Master of Science (thesis and non-thesis options; on-campus and hybrid); and Doctor of Philosophy (on-campus and distance hybrid) with a major in apparel, merchandising, and design. For all programs the field of study is highly interdisciplinary; programs of study are tailored to students' background and interests. The program offers a concurrent B.S. and M.S. degree that allows students to obtain

both the B.S. and M.S. degrees in apparel, merchandising, and design in 5 years. Application for admission to the Graduate College should be submitted in fall semester of the junior year.

Graduates understand how textiles and apparel are essential in meeting individual and societal needs and understand the interdependence of nations and cultures as producers and consumers. Graduates understand diverse philosophies of scholarship and apply multiple methods to creative activity, research, and teaching. Strong writing and oral communication skills help graduates disseminate scholarship and compete successfully for awards and grants.

Graduates accept positions relevant to their academic experience. All doctoral graduates have teaching experience. Master's and doctoral graduates have experience working in team-oriented and interactive environments. Graduates are prepared to adapt to future changes in their professions and to provide leadership in professional and public practice.

They bring a strong sense of ethics to research, teaching, and business endeavors.

Program emphases for graduate study include creative design and functional design; product development; consumer behavior; entrepreneurship; merchandising and marketing aspects of textiles and clothing; acquisition and use of textiles and apparel within cultures; U.S. dress and textiles from the 19th into the 21st centuries; textiles and sustainability.

## Athletic Training

This major prepares students for a career as an athletic trainer in a variety of settings such as high school, college and professional settings.

There are additional settings in sports medicine clinics, hospitals, military, industry, and in performing arts. The accredited program will prepare students for the Board of Certification exam upon graduation. Admission to the athletic training program is competitive and based on available departmental resources. Admission procedures and technical standards can be found at <http://www.kin.hs.iastate.edu/programs/athletic-training/#program-information-and-requirements>.

Iowa State University's Athletic Training Program has transitioned to a Professional Master's degree program. Undergraduate students will be enrolled in the 3+2 athletic training program with a 3-year Pre-Athletic Training undergraduate curriculum and a 2-year Masters of Athletic Training program in the Department of Kinesiology. Students with a B.S. or B.A. degree may apply directly to the Master's program with completion of prerequisite coursework, program requirements, and observation hours. For more information, please contact the program director, Dr. Mary Meier, at [mary@iastate.edu](mailto:mary@iastate.edu).

## Mission

Athletic training is the art and science of the prevention, recognition, care, and rehabilitation of athletic injuries. It includes the organization and administration of athletic training education programs, as well as the education and counseling physically active individuals and athletes. The Iowa State University athletic training program provides high quality education striving to instill intellectual curiosity, evidence-based knowledge, and clinical skills essential for individual development. The athletic training program enrolls academically qualified students who represent diverse socio-economic levels, ethnic heritage and who provide a gender balance. The program faculty and clinical preceptors strive to prepare athletic training students to be productive and responsible citizens of the world and to foster affective, caring individuals to promote the profession of athletic training.

The Athletic Training faculty and clinical preceptors continually update educational curriculum to keep athletic training students current with field knowledge and to ensure the best possible undergraduate and graduate education in both the didactic and clinical settings.

## Goals

1. We prepare athletic training students for the BOC Certification Exam.
2. We produce high quality athletic trainers prepared for employment in educational, clinical, and professional settings.
3. We promote professional and ethical conduct at all times.
4. We provide athletic training students equal opportunity to develop their skills both in the classroom and in the clinical settings.
5. We continually update the curricular offerings to provide the athletic training student current evidence based knowledge in the profession.
6. We provide high quality instruction in the classroom and clinical experiences.
7. We assist the athletic training student in gaining employment.
8. We promote the concept of establishing professional contacts by attending professional and educational meetings.
9. We foster an appreciation of athletic training as a component of sports medicine.
10. We foster the affective, caring side of athletic training.

## Student Learning Objectives

1. Athletic training graduates will use effective communication skills.
2. Athletic training graduates will demonstrate competence in athletic training skills and knowledge.
3. Athletic training graduates will possess ethical, caring, professional attributes and behaviors as a health care professional.
4. Athletic training graduates will demonstrate effective critical thinking and problem-solving skills ensuring them of being an effective athletic trainer.

5. Athletic training graduates will demonstrate the ability to apply clinical skills and make evidence-based decisions to optimize patient outcomes.

## UNDERGRADUATE STUDY

The Department of Kinesiology offers a Bachelor of Science degree in Kinesiology & Health. The B.S. in Athletic Training degree is only offered upon completion of the 3+2 B.S./M.A.TR. Athletic Training program.

The undergraduate curriculum major/option is comprised of three components: general education, required departmental courses and the component courses. The intent of the general education component is to promote intellectual and personal growth and to prepare students for success in the basic, advanced and major/option components. Required courses provide an introduction to the field and fundamental principles of physical activity, fitness, health and disease.

### B.S./M.A.TR. degree in Athletic Training

Certified Athletic Trainers are allied medical health care professionals who specialize in the prevention, assessment, diagnosis, emergency care, and treatment and rehabilitation of injuries. To gain certification as an athletic trainer, candidates must graduate from a CAATE accredited athletic training education program and successfully pass the Board of Certification (BOC) examination. In addition, most states have licensure requirements to practice athletic training. The ISU Athletic Training undergraduate education program has been CAATE accredited since 2001 and has transitioned to a Professional Master's program. The Athletic Training program at Iowa State University includes various athletic training clinical rotations including high school settings, physical therapy and hospital clinics, college and university settings, surgical and emergency room observations, and immersive clinical opportunities in orthopedic and non-orthopedic settings.

### Curriculum in Athletic Training

This major prepares students for a career as an athletic trainer in high school, college, professional sport settings. Additional settings include sports medicine clinics, hospitals, military, industry, and with the performing arts. The 3+2 program prepares students for the Board of Certification exam upon graduation from the Master's program. Admission to the Athletic Training Master's degree program is competitive. Admission requirements for the Professional Master's in Athletic Training program can be found at <http://www.kin.hs.iastate.edu/graduate-programs/athletic-training/> (<http://www.kin.hs.iastate.edu/programs/athletic-training/#program-information-and-requirements>).

## Curriculum in Athletic Training

### Communication Proficiency

In order to meet graduation requirements, all students must earn an average of C (2.0) or better in ENGL 150 and ENGL 250, with neither grade

being lower than a C-. Students not meeting this condition must earn a C or better in an advanced writing course:

ENGL 302	Business Communication	3
or ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3

### U.S. Diversity and International Perspectives

In order to meet graduation requirements, all students must complete 3 cr. of course work in U.S. Diversity and 3 cr. in International Perspectives. See university approved list.

### General Education

#### Physical and Life Sciences:

BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
BIOL 256	Fundamentals of Human Physiology	3
BIOL 256L	Fundamentals of Human Physiology Laboratory	1

#### Additional major-specific requirements are:

CHEM 163	College Chemistry	4
or CHEM 177	General Chemistry I	
CHEM 163L	Laboratory in College Chemistry	1
or CHEM 177L	Laboratory in General Chemistry I	
FS HN 167	Introductory Human Nutrition and Health	3
PHYS 131	General Physics I	4-5
& 131L	and General Physics I Laboratory	
or PHYS 115	Physics for the Life Sciences	

### Mathematics and Statistics:

From the following: 3-4

MATH 140	College Algebra	
or MATH 141	Preparation for Calculus	
or MATH 142	Applied Trigonometry	
or MATH 161	Calculus I	

From the following: 3-4

STAT 101	Principles of Statistics	
or STAT 104	Introduction to Statistics	

### Social Sciences: 9 cr. min required

PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3

### Humanities: 6 cr. min required

Choose from department approved list.



**Communications:**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
One of the following		3
ENGL 302	Business Communication	
or ENGL 314	Technical Communication	
or SP CM 31	Business and Professional Speaking	

**Program requirements:**

The following courses are required in all majors and options:

H S 110	Personal and Consumer Health	3
H S 350	Human Diseases (*)	3
KIN 252	Introduction to the Discipline of Kinesiology	1
KIN 253	Orientation and Learning Community in Kinesiology and Health	1
KIN 258	Principles of Physical Fitness and Conditioning	2
KIN 358	Exercise Physiology (*)	3
KIN 359	Exercise Physiology Lab	1
KIN 373	Biomechanics and Motor Control Laboratory	1

\* A grade of C- or better is required.

**Courses for Athletic Training Major**

Option Requirements:

A TR 219	Anatomy Clinical Practicum	1
A TR 220	Basic Athletic Training	2
A TR 221	Pre-Athletic Training Clinical Practicum	1
A TR 223	Preseason Clinical Experience Practicum	1
KIN 355	Biomechanics (*)	3
KIN 365	Sport Psychology (*)	3
or KIN 366	Exercise Psychology	
KIN 480	Functional Anatomy	3
Electives		3

\* A grade of C- or better is required.

**Athletic Training B.S./Masters (B.S./M.A.T.R.) Degree**

Sample Five-Year Plan

**First Year**

Fall	Credits	Spring	Credits
A TR 218	0.5	A TR 218	0.5
BIOL 255*	3	BIOL 211 or 212	3
BIOL 255L*	1	BIOL 211L or 212L	1
ENGL 150	3	BIOL 256**	3
H S 110	3	BIOL 256L**	1
KIN 252	1	FS HN 167	3
KIN 253	1	SOC 134	3
LIB 160	1	STAT 101 or 104	3-4
PSYCH 101	3		
<b>16.5</b>		<b>17.5-18.5</b>	

**Second Year**

Fall	Credits	Spring	Credits
A TR 220*	2	A TR 217**	1
A TR 221*	1	A TR 219	1
CHEM 163 or 177	4	KIN 258	2
CHEM 163L or 177L	1	MATH 140, 143, 145, or 165	3-4
ENGL 250	3	PHYS 115 or 131 <i>and</i> 131L	4-5
Humanities Choice/US Diversity	3	SP CM 212	3
Psych Choice	3	Humanities Choice/International Perspectives	3
<b>17</b>		<b>17-19</b>	

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
A TR 223*	1	A TR 328**	1	A TR 501	1
A TR 228*	2	H S 350	3	A TR 502	3
A TR 229*	1	KIN 365 or 366	3	A TR 509	1
ENGL 302, 314, or SP CM 312	3	KIN 372	3	A TR 520	1

FS HN 367	1 KIN 373	1
KIN 355	3 KIN 480 or B M S 448	3-4
KIN 358	3 PSYCH 460	3
KIN 359	1	

Apply for admission to the AT/MATR program in December.

Acceptance into the program is required before spring of the third year.

15		17-18		6
Fourth Year				
Fall	Credits	Spring	Credits	Summer Credits
A TR 505 <sup>*</sup>		3 A TR 513 <sup>**</sup>		3 A TR 515
A TR 510 <sup>*</sup>		3 A TR 522 <sup>**</sup>		1 A TR 523
A TR 519 <sup>*</sup>		3 A TR 529 <sup>**</sup>		3 A TR 539
A TR 521 <sup>*</sup>		1 A TR 545 <sup>**</sup>		3 A TR 560
		KIN 501 <sup>**</sup>		3
10		13		8
Fifth Year				
Fall	Credits	Spring	Credits	
A TR 550		2 A TR 524 <sup>**</sup>	1	
A TR 559 <sup>*</sup>		4 A TR 569 <sup>**</sup>	5	
A TR 570 <sup>*</sup>		3 A TR 575 <sup>**</sup>	3	
H S 564		3		
12		9		

**Optional experiences: A TR 549A and A TR 549B Athletic Training Clinical Education Study Abroad (3 credits).**

\* Fall Only Course

\*\* Spring Only Course

Planned course offerings may change, and students need to check the online Schedule of Classes each term to confirm course offerings: <https://classes.iastate.edu/>.

Humanities, Social Science, International Perspectives, and US Diversity courses: <https://kin.hs.iastate.edu/current-students/academics/resources-and-registration/>  
This sequence is only an example.

Students who have already completed, or will complete, a B.A. or B.S. degree from an accredited institution and who have completed necessary prerequisite course work and other admission requirements can apply for the Master's in Athletic Training program. More information on the admissions requirements and application can be found here: <https://kin.hs.iastate.edu/graduate-students/graduate-program/masters-in-athletic-training/admissions-requirements-application/>.

## Athletics

Administered by the Department of Kinesiology.

**Courses primarily for undergraduates:**

### ATH 101: Intercollegiate Athletics

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

### ATH 101B: Intercollegiate Athletics: Basketball (men)

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

### ATH 101C: Intercollegiate Athletics: Basketball (women)

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

### ATH 101D: Intercollegiate Athletics: Cross Country (men)

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101E: Intercollegiate Athletics: Cross Country (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101F: Intercollegiate Athletics: Football (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101G: Intercollegiate Athletics: Golf (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101J: Intercollegiate Athletics: Gymnastics (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101K: Intercollegiate Athletics: Softball (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101M: Intercollegiate Athletics: Swimming/Diving (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101O: Intercollegiate Athletics: Tennis (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101P: Intercollegiate Athletics: Track and Field (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101Q: Intercollegiate Athletics: Track and Field (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101R: Intercollegiate Athletics: Volleyball (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101S: Intercollegiate Athletics: Wrestling (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101T: Intercollegiate Athletics: Golf (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101U: Intercollegiate Athletics: Soccer (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of head coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only.

Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

## Culinary Food Science (H SCI)

The Culinary Food Science degree program is a food science-based degree in which students develop basic culinary skills along with knowledge of the accompanying sciences. As a graduate, you'll combine food product development skills and entrepreneurial talents with scientific and technological knowledge.

The department also offers a culinary food science minor.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Culinary Food Science major.

## Degree Requirements

Administered by the Department of Food Science and Human Nutrition

### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

**Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3

LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

### Humanities and Social Sciences: 9-15 cr.

FS HN 220	American Food and Culture	3
ECON 101	Principles of Microeconomics	3

If a Culinary Food Science student in the College of Human Sciences, select:

Additional Humanities course

Additional Humanities or Social Science course

### Ethics: 3 cr. (Included as part of the Humanities and Social sciences requirement)

FS HN 342	World Food Issues: Past and Present	3
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### Mathematical Sciences: 6-8 cr.

Select at least 3 credits from: 3-4

MATH 140	College Algebra
MATH 143	Preparation for Calculus
MATH 160	Survey of Calculus
MATH 165	Calculus I

Select at least 3 credits from: 3-4

STAT 101	Principles of Statistics
STAT 104	Introduction to Statistics

**Total Credits 6-8**

### Physical Sciences: 9 cr.

CHEM 163	College Chemistry	4
or CHEM 177	General Chemistry I	
CHEM 163L	Laboratory in College Chemistry	1
or CHEM 177L	Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1

**Total Credits 9**

### Biological Sciences: 10-11 cr.

BBMB 301	Survey of Biochemistry	3
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
MICRO 201	Introduction to Microbiology	2-3
or MICRO 302	Biology of Microorganisms	
MICRO 201L	Introductory Microbiology Laboratory	1
or MICRO 302L	Microbiology Laboratory	

**Total Credits 10-11**

**Animal Science Coursework: 6 cr.**

AN S 270	Foods of Animal Origin	2
AN S 270L	Foods of Animal Origin Laboratory	1
AN S 460	Science and Technology of Value Added Meat Products	3

<b>Total Credits</b>	<b>6</b>
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**Food Science and Human Nutrition: 42 cr.**

FS HN 101	Food and the Consumer	3
FS HN 104	Introduction to Professional Skills in Culinary Science	1
FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	1
FS HN 214	Scientific Study of Food	3
FS HN 215	Advanced Food Preparation Laboratory	2
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 305	Food Quality Management and Control	2
FS HN 311	Food Chemistry	3
FS HN 311L	Food Chemistry Laboratory	1
FS HN 314	Professional Development for Culinary Food Science and Food Science Majors	1
FS HN 403	Food Laws and Regulations	2
FS HN 406	Sensory Evaluation of Food	3
FS HN 407	Microbiological Safety of Foods of Animal Origins	3
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 412	Food Product Development	3
FS HN 420	Food Microbiology	3
Take one of the following courses for 2 credits:		2

FS HN 491B	Supervised Work Experience: Food Science or FS HN 491 Supervised Work Experience: Culinary Science	
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<b>Total Credits</b>	<b>42</b>
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**Hospitality Management: 12 cr.**

HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
HSP M 383	Wine and Spirits in Hospitality Management	2
or FS HN 509	Sensory Evaluation of Wines	
HSP M 487	Fine Dining Management	3

<b>Total Credits</b>	<b>12</b>
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**Electives 1-13 cr. Select from any university coursework to earn at least 120 total credits.**

Go to FS HN courses.

**Culinary Food Science, B.S.****First Year**

Fall	Credits	Spring	Credits
FS HN 110	1	FS HN 104	1
CHEM 163 or 177	4	FS HN 167	3
CHEM 163L or 177L	1	BIOL 212	3
FS HN 101	3	BIOL 212L	1
MATH 140, 143, 160, or 165	3-4	ECON 101	3
ENGL 150	3	STAT 104 or 101	3-4
LIB 160	1		
<b>16-17</b>		<b>14-15</b>	

**Second Year**

Fall	Credits	Spring	Credits
CHEM 231	3	FS HN 265	3
CHEM 231L	1	BBMB 301	3
ENGL 250	3	MICRO 201 or 302	2-3
FS HN 203	1	MICRO 201L or 302L	1
FS HN 220	3	FS HN 214	3
HSP M 133	1	FS HN 215	2
SP CM 212	3		
<b>15</b>		<b>14-15</b>	

**Third Year**

Fall	Credits	Spring	Credits	Summer	Credits
AN S 270	2	FS HN 305	2	FS HN 491B or 491D	2
AN S 270L	1	FS HN 403	2		
FS HN 311	3	HSP M 380	3		
FS HN 311L	1	HSP M 380L	3		
FS HN 314	1	Humanities or social science (H Sci) or elective (AgLS)	3		

FS HN 411	2 Elective *	3
FS HN 420	3	
Electives *	1-3	

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14-16                      16                      2

**Fourth Year**

Fall	Credits	Spring	Credits
FS HN 406	3	AN S 460	3
FS HN 407	3	FS HN 342	3
FS HN 491B or 491D (if not yet completed)	2	FS HN 412	3
HSP M 383 (if not taking FS HN 509 Spring)	2	Humanities (H Sci) or Elective (AgLS)	3
HSP M 487 U.S. Diversity	3	Elective *	3
	3		
	16	15	

\* Choose elective courses to total equal to or greater than 120 credits.

Notes: Planned course offerings may change and students need to check the online Schedule of Classes each term to confirm course offerings: <https://classes.iastate.edu> (<https://classes.iastate.edu/>).

This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on the Culinary Food Science minor can be found here: [www.catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext](http://www.catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext).

## Dance

Administered by the Department of Kinesiology.

Coursework in dance provides opportunities for students to develop an understanding and appreciation of dance as part of a liberal education. Those interested in teaching dance and physical education in the public schools may major in Kinesiology and Health (Teacher Licensure option) and minor in Dance.

A Performing Arts major with a Dance emphasis is available through the College of Liberal Arts and Sciences. For further information see: Performing Arts.

## Diet and Exercise (H SCI)

### OVERVIEW

#### Diet and Exercise, B.S./M.S.

Administered by the Department of Food Science and Human Nutrition and Department of Kinesiology.

This is an accelerated program with concurrent enrollment in the undergraduate and graduate degree programs. Courses included have been approved as meeting the academic requirements of the Didactic Program in Dietetics (DPD) in preparation for admission to accredited dietetics internship programs; the DPD is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. There is a \$30 fee for the verification statement of completion of the accredited dietetics program. Additionally, courses are included to meet the American College of Sports Medicine (ACSM) requirements for certification at the level of Certified Exercise Physiologist.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Diet & Exercise major.

## Degree Requirements

**Total Degree Requirements: 120 cr. for bachelor's degree and 36-40 cr. for master's degree**

**International Perspectives: 3 cr.**

**U.S. Diversity: 3 cr.**

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements.



**Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

**Social Sciences: 6 cr.**

PSYCH 101	Introduction to Psychology	3
KIN 366	Exercise Psychology	3
<b>Total Credits</b>		<b>6</b>

**Mathematical Sciences: 6-8 cr.**

Select at least 3 credits from: 3-4

MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
STAT 226	Introduction to Business Statistics I	

**Total Credits** 6-8**Physical Sciences: 13 cr.**

Select from: 5

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
PHYS 115	Physics for the Life Sciences	4
or PHYS 131	General Physics I	
<b>Total Credits</b>		<b>13</b>

**Biological Sciences: 13 cr.**

BBMB 301	Survey of Biochemistry	3
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
BIOL 256	Fundamentals of Human Physiology	3
BIOL 256L	Fundamentals of Human Physiology Laboratory	1
MICRO 201	Introduction to Microbiology	2
<b>Total Credits</b>		<b>13</b>

**Diet and Exercise undergraduate courses to be completed or in progress when applying for admission to the program: 21-23 cr.**

Select from: 1-2

FS HN 110	Professional and Educational Preparation	
or KIN 252 & KIN 253	Introduction to the Discipline of Kinesiology and Orientation and Learning Community in Kinesiology and Health	
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 214	Scientific Study of Food	3
FS HN 215	Advanced Food Preparation Laboratory	1-2
or FS HN 115	Food Preparation Laboratory	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 340	Foundations of Dietetic Practice	2
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
H S 110	Personal and Consumer Health	3
KIN 258	Principles of Physical Fitness and Conditioning	2

**Total Credits** 21-23**Acceptance into the BS/MS PROGRAM is required BEFORE spring semester of the THIRD year.****Humanities and Ethics: 6-9 cr.**

Select 6 credits from approved Humanities list 6

Select 3 credits from approved Ethics list 3

Note: If ethics course is on the humanities list, it can meet both requirements.

**Diet and Exercise remaining undergraduate courses to complete the bachelor's degree requirements: 42 cr.**

H S 380	Worksite Health Promotion	3
A TR 220	Basic Athletic Training	2
or H S 305	Instructor's First Aid and Cardiopulmonary Resuscitation	
KIN 259	Leadership Techniques for Fitness Programs	3
KIN 345	Management of Health-Fitness Programs and Facilities	3
or FS HN 392	Food and Nutrition Services Management	
KIN 358	Exercise Physiology	3
KIN 359	Exercise Physiology Lab	1
Select two from:		6
KIN 355	Biomechanics	
KIN 360	Sociology of Physical Activity and Health	
KIN 372	Motor Control and Learning Across the Lifespan	
KIN 458	Principles of Fitness Assessment and Exercise Prescription	
KIN 462	Medical Aspects of Exercise	3

FS HN 361	Nutrition and Health Assessment	2
FS HN 367	Medical Terminology for Health Professionals	1
FS HN 430	U.S. Health Systems and Policy	2
FS HN 466	Nutrition Counseling and Education Methods	3
HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
NUTRS 563	Community Nutrition and Health *	3
<b>Total Credits</b>		<b>42</b>

**Diet and Exercise graduate courses to complete the master's degree requirements: 36-40 cr.**

FS HN 581	Seminar **	1
FS HN 590C	Special Topics: Teaching **	1
FS HN 681	Seminar **	1
FS HN 682	Seminar Reflection **	R
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4
NUTRS 561	Medical Nutrition and Disease I	4
NUTRS 563	Community Nutrition and Health *	3
NUTRS 564	Medical Nutrition and Disease II *	4
KIN 501	Research Methods in Physical Activity	3
KIN 505	Research Laboratory Techniques in Exercise Physiology	3
KIN 550	Advanced Physiology of Exercise I	3
or KIN 551	Advanced Physiology of Exercise II	
STAT 587	Statistical Methods for Research Workers	4
Select 3-6 additional credits (FSHN students select 3 credits, KIN students select 6 credits) from:		3-6
KIN 550	Advanced Physiology of Exercise I	
KIN 551	Advanced Physiology of Exercise II	
KIN 567	Exercise and Health: Behavior Change	
KIN 570	Physical Activity Assessment for Health Related Research	

Select 2-3 credits for creative component or 6 credits for thesis research:

FS HN 599	Creative Component
KIN 599	Creative Component
KIN 699	Research
NUTRS 699	Research in Nutritional Sciences

\* Course counts toward both bachelor's and master's degrees.

\*\* Requirement for students in the FS HN Department.

Go to FS HN courses.

Go to KIN courses.

## Diet and Exercise, B.S./M.S.

### First Year

Fall	Credits	Spring	Credits
FS HN 110 or KIN 252 and KIN 253		1-2 ENGL 250	3
CHEM 163 or 177		4 FS HN 167	3
CHEM 163L or 177L		1 H S 110	3
ENGL 150		3 KIN 258	2
LIB 160		1 STAT 101, 104, or 226	3-4
MATH 140, 143, 160, or 165		3-4	
PSYCH 101	3		

**16-18**

**14-15**

### Second Year

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 255		3 BBMB 301		3 SP CM 212	3
BIOL 255L		1 BIOL 256		3 U.S. Diversity	3
CHEM 231		3 BIOL 256L		1	
CHEM 231L		1 FS HN 265		3	
KIN 259		3 FS HN 214		3	
A TR 220 or H S 305		2 FS HN 115 or 215		1-2	
MICRO 201		2 HSP M 133		1	

**15**

**15-16**

**6**

### Third Year

Fall	Credits	Spring	Credits	Summer	Credits
FS HN 340		2 Acceptance into the program required before spring of the third year		KIN 599, FS HN 599, KIN 699, or NUTRS 699	1-3
FS HN 360		3 FS HN 361		2 STAT 587	4

KIN 358	3 FS HN 367	1	
KIN 359	1 HSP M 380	3	
Select from:	3 HSP M 380L	3	
KIN 360 or 372	KIN 366	3	
PHYS 115 or 131	4 Select from:	3	
Apply for admission to the BS/MS program by Oct. 1	KIN 355 or 458		

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16	15	5-7
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**Fourth Year**

Fall	Credits	Spring	Credits	Summer	Credits
KIN 505		3 NUTRS 564		4 KIN 599, FS HN 599, KIN 699, or FS HN 699	1-3
KIN 550, 551, 567, or 570		3 KIN 501		3	
FS HN 430		2 KIN 551		3	
FS HN 682 (FS HN Dept)		R KIN 462		3	
NUTRS 561		4 FS HN 581 (FS HN Dept)		1	
NUTRS 563 (Time conflict with NUTRS 501 next fall)		3 FS HN 682 (FS HN Dept)		R	

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15	14	1-3
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**Fifth Year**

Fall	Credits	Spring	Credits
NUTRS 501		4 KIN 345 or FS HN 392	3

FS HN 682 (FS HN Dept)	R KIN 699, NUTRS 699, KIN 599, or FS HN 599	2
Additional: KIN 550, KIN 551, KIN 567, or KIN 570	3 FS HN 466	3
H S 380	3 FS HN 590C (FS HN Dept)	1
Humanities/Ethics course	3 FS HN 681 (FS HN Dept)	1
	Humanities/International Perspectives	3

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13	13
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Planned course offerings may change, and students need to check the online Schedule of Classes each term to confirm course offerings: <http://classes.iastate.edu/>. This sequence is only an example.

## Dietetics (H SCI)

Dietitians are nutrition experts who strive for optimal health and nutrition of individuals and the population. The curriculum for the dietetics program as well as the diet and exercise program meet the academic requirements of the Didactic Program in Dietetics and prepares students for a career in the field of dietetics. The program is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency for the Academy of Nutrition and Dietetics.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.

- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Dietetics major.

#### Administered by the Department of Food Science and Human Nutrition

The dietetics undergraduate curriculum meets the academic requirements as the Didactic Program in Dietetics and is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. Graduates of the program are eligible to apply for admission to accredited supervised practice programs/dietetics internships. There is a \$30 fee for the verification statement of completion of the accredited dietetics program.

#### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

#### International Perspectives: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communications and Library: 10 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

#### Humanities and Social Sciences: 6-12 cr.

Select Humanities course from approved list	3
PSYCH 101      Introduction to Psychology	3
If H Sci student, select:	6
Additional Humanities course	
Additional Humanities or Social Science course	

#### Ethics: 3 cr.

FS HN 342	World Food Issues: Past and Present	3
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#### Mathematical Sciences: 6-8 cr.

Select at least 3 credits from:	3-4
MATH 140	College Algebra
MATH 143	Preparation for Calculus
MATH 160	Survey of Calculus
MATH 165	Calculus I
Select at least 3 credits from:	3-4
STAT 101	Principles of Statistics

STAT 104	Introduction to Statistics
<b>Total Credits</b>	<b>6-8</b>

#### Physical Sciences: 9 cr.

Select from:		5
CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	
or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 231	Elementary Organic Chemistry	3
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
<b>Total Credits</b>		<b>9</b>

#### Biological Sciences: 17-18 cr.

BBMB 301	Survey of Biochemistry	3
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
Select at least 3 credits from:		3-4
BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	
BIOL 335	Principles of Human and Other Animal Physiology	
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1
Total Credits		17-18

#### Food Science and Human Nutrition: 44-45 cr.

FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 214	Scientific Study of Food	3
FS HN 215	Advanced Food Preparation Laboratory	1-2
or FS HN 115	Food Preparation Laboratory	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 340	Foundations of Dietetic Practice	2
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 367	Medical Terminology for Health Professionals	1
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 430	U.S. Health Systems and Policy	2
FS HN 445	Strategies for Personal Food Waste Reduction	1
FS HN 461	Medical Nutrition and Disease I	4

FS HN 463	Community Nutrition and Health	3
FS HN 464	Medical Nutrition and Disease II	4
FS HN 466	Nutrition Counseling and Education Methods	3
COMST 450B	Special Topics in Communication Studies: Health Communication	3

**Total Credits** **44-45**

**Management: 10 cr.**

HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
FS HN 392	Food and Nutrition Services Management	3

**Total Credits** **10**

**Electives: 0-15 cr. Select from any university coursework to earn at least 120 total credits.**

Go to FS HN courses.

## Dietetics, B.S.

### First Year

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 167	3
CHEM 163 or 177	4 BIOL 212	3
CHEM 163L or 177L	1 BIOL 212L	1
MATH 140, 143, 160, or 165	3-4 HSP M 133	1
ENGL 150	3 PSYCH 101	3
LIB 160	1 Humanities/Social Sci. (H Sci) or Elective (AgLS) course	3
Humanities	3	
<b>16-17</b>		<b>14</b>

### Second Year

Fall	Credits Spring	Credits
CHEM 231	3 FS HN 265	3
CHEM 231L	1 BBMB 301	3
BIOL 255	3 BIOL 256 and 256L, or BIOL 335	3-4
BIOL 255L	1 MICRO 201	2
ENGL 250	3 MICRO 201L	1
STAT 101 or 104	3-4 Humanities course (H Sci) or Elective* (AgLS)	3
<b>14-15</b>		<b>15-16</b>

### Third Year

Fall	Credits Spring	Credits
FS HN 340	2 FS HN 361	2

FS HN 360	3 FS HN 362	3
FS HN 214	3 FS HN 367	1
FS HN 215 or 115	1-2 HSP M 380	3
SP CM 212	3 HSP M 380L	3
FS HN 342	3 COMST 450B	3

**15-16** **15**

### Fourth Year

Fall	Credits Spring	Credits
FS HN 461	4 FS HN 464	4
FS HN 463	3 FS HN 445	1
FS HN 411	2 FS HN 430	2
FS HN 466	3 FS HN 392	3
U.S. Diversity	3 Electives *	6
<b>15</b>		<b>16</b>

### Footnotes

\* Choose elective courses to total equal to or greater than 120 credits.

Note: This sequence is only an example, and the number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on minors offered through Food Science and Human Nutrition can be found here: <http://catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Professional Practice in Dietetics (M.P.P.). More information on the program can be found here: <http://catalog.iastate.edu/collegeofhumansciences/professionalpracticeindietetics/>.

## Early Childcare Education and Programming Curriculum in Early Childcare Education and Programming

The **Early Childcare Education and Programming (E C P)** curriculum is designed to prepare graduates to work in a variety of early care and education programs that serve families that are mobile. Families who are mobile include military families, immigrant families, families who must travel to make a living, homeless families, and families living in poverty. Some of the programs are childcare centers and homes, infant/

toddler and preschool programs, Head Start programs, and before and after-school programs for children ages birth to eight. This degree does not lead to teacher licensure. Students interested in a license to teach in public schools can refer to the Early Childhood Education - Unified (ECE) program. The E C P curriculum is designed to provide content for the final two years of a student's program; the content is focused specifically on topics directly relevant to the major. This is an online program offered through a collaboration of universities called Great Plains Interactive Distance Education Alliance (or GPIDEA). The program within GPIDEA is known as Early Care and Education for a Mobile Society. For more information see <https://www.gpidea.org/program/early-care-and-education-in-a-mobile-society> (<https://www.gpidea.org/program/early-care-and-education-in-a-mobile-society/>)

Students will complete a total of 120 credits for the major, 51 of which are specific to the E C P curriculum. These 51 credit hours are comprised of 12 core courses and 3 practica; the final practicum will be a 6-credit capstone experience. Students must complete 30 credits of college work, a lifespan development course, and have a 2.5 GPA to be admitted to E C P. If students prefer to be admitted to ISU before being admitted to the E C P major, they can enroll as Pre ECP (P ECP) students until they are eligible for the E C P major. For more information about the program at Iowa State, see <https://online.hs.iastate.edu/early-childcare-programming> (<https://online.hs.iastate.edu/early-childcare-programming/>).

## Student Learning Outcomes

Upon successful completion of the ECEMS bachelor's degree program, students will be able to:

- use their understanding of young children's characteristics and needs, and of multiple interacting influences on children's development and learning, to create environments that are healthy, respectful, supportive, and challenging for each child.
- understand how successful early childhood education depends upon partnerships with children's families and communities and value the importance and complex characteristics of children's families and communities.
- use child observation, documentation, and other forms of assessment, in partnership with families and other professionals, to positively influence the development of every child.
- use their knowledge of academic disciplines to design, implement, and evaluate experiences that promote positive development and learning for every young child.
- identify and conduct themselves as a member of the early childhood profession, using ethical guidelines and other professional standards related to early childhood practice.
- demonstrate, through sequential practicum experiences and clinical practice, the knowledge, skills, and professional dispositions

necessary to promote the development and learning of young children across the entire developmental period of early childhood.

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science.

## Total credits required: 120

### Human Development and Family Studies Core: 3 credits

HD FS 102	Human Development	3
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### Early Childcare Education and Programming Professional Core: 51 credits

#### Pre-practicum I

E C P 201	Child Development – Ages Birth to 3	3
E C P 202	Child Development – Ages 4 to 8	3
E C P 305	Professional Development	3
E C P 320	Practicum I – Child Observations in Classroom Environments	3

#### Pre-practicum II

E C P 412	Development of Curriculum for Children Ages Birth to 3 *	3
E C P 413	Development of Curriculum for Children Ages 4 to 8 *	3
E C P 424	Assessing Young Children and Their Environments to Enhance Development *	3
E C P 425	Understanding and Adapting for Developmental Differences *	3
E C P 440	Practicum II – Curriculum Development and Implementation	3

#### Professional Development

E C P 306	Health, Safety, and Nutrition	3
E C P 307	Child Guidance and Classroom Environments	3
E C P 322	Diversity in the Lives of Young Children and Families	3
E C P 323	Working with Families	3
E C P 324	Technology and Young Children	3
E C P 442	Administration and Supervision in Early Childhood Settings	3
E C P 460	Practicum III – Capstone Experience	6

**Total Credits** 51

**\* Must be completed prior to enrollment in Practicum II (E C P 440)**

### Electives : 28-29 credits

### Communications and Library: 13 credits

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3



LIB 160	Introduction to College Level Research	1
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
COMST 211	Interpersonal Communication	
COMST 218	Conflict Management	
One of the following:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>13</b>

### Natural Sciences and Mathematical Disciplines: 9-10 credits

One of the following:		3-4
STAT 101	Principles of Statistics	
MATH 104	Introduction to Probability	
MATH 105	Introduction to Mathematical Ideas	
MATH 140	College Algebra	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 165	Calculus I	
Select from Biological or Physical Sciences courses		6
<b>Total Credits</b>		<b>9-10</b>

### Social Sciences: 9 credits

Select from Approved General Education options

### Humanities: 6 credits

Select from Approved General Education options

### Total credits: 120 credits

**The courses listed in this section are approved general education course options for this major.**

**Social Sciences:** 9 credits. Coursework designed to help students develop an understanding of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions.

AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AF AM 330	Ethnic and Race Relations	3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	3
A M D 362	Cultural Perspectives of Global Dress	3
A M D 467	Consumer Studies in Apparel and Fashion Products	3
AM IN 310	Contemporary Topics in American Indian Studies	3

AM IN 315	Archaeology of North America	3
AM IN 322	Peoples and Cultures of Native North America	3
Anthropology (ANTHR) - except 202		
Economics (ECON)		
FS HN 342	World Food Issues: Past and Present	3
INTST 235	Introduction to International Studies	3
LING 219	Introduction to Linguistics	3
LING 471	Language and Reading Development in Children	3
Political Science (POL S)		
Psychology (PSYCH) - except 131		
Sociology (SOC), including Criminal Justice (CJ ST)		
WGS 201	Introduction to Women's and Gender Studies	3
WGS 203	Introduction to Lesbian Communities	3
WGS 301	International Perspectives on Women and Gender	3
WGS 320	Ecofeminism	3
WGS 327	Gender and Sexualities in Society	3
WGS 328	Sociology of Masculinities and Manhood	3
WGS 346	Psychology of Women	3
WGS 350	Women of Color in the U.S	3
WGS 385	Women in Politics	3

**Humanities:** 6 credits. Coursework designed to assist students to develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.

AESHM 342	Aesthetics of Consumer Experience	3
AF AM 201	Introduction to African American Studies	3
AF AM 334	Africana Religions	3
AF AM 347	Studies in African American Literature	3
AF AM 353	History of African Americans I	3
AF AM 354	History of African Americans II	3
A M D 257	Museum Studies	3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	3
A M D 356	Euro-American Dress History: Mid-19th Century to the Present	3
AM IN 210	Introduction to American Indian Studies	3
AM IN 240	Introduction to American Indian Literature	3
AM IN 346	American Indian Literature	3
ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 420	Topics in American Architecture	3
Art History (ART H)		
American Sign Language (ASL)		
Classical Studies (CL ST)		

DANCE 270	Dance Appreciation	3
DANCE 360	History and Philosophy of Dance	3
DSN S 183	Design in Context	3
ENGL 201	Introduction to Literature	3
ENGL 225	Survey of British Literature to 1800	3
ENGL 226	Survey of British Literature since 1800	3
ENGL 227	Survey of American Literature to 1865	3
ENGL 228	Survey of American Literature since 1865	3
ENGL 237	Survey of Film History	3
ENGL 240	Introduction to American Indian Literature	3
History (HIST)		
HSP M 260	Global Tourism Management	3
MUSIC 102	Introduction to Music Listening	3
MUSIC 302	Masterpieces of Music and Art in Western Culture.	3
MUSIC 304	History of American Rock 'n' Roll	3
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3
Philosophy (PHIL)		
Religious Studies (RELIG)		
THTRE 106	Introduction to the Performing Arts	3
THTRE 110	Theatre and Society	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
WGS 201	Introduction to Women's and Gender Studies	3
WGS 336	Religion, Sex and Gender	3
WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
WGS 370	Studies in English Translation	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3

World Languages and Cultures (ARAB, CHIN, FRNC, GER, GREEK, RUS, SPAN)

## Early Childhood Education - Unified

Administered by the Department of Human Development and Family Studies and the School of Education. Leading to the degree bachelor of science.

The curriculum in early childhood education – unified (ECE) prepares graduates to teach young children and work with their families. This curriculum has been approved by the Iowa Department of Education and meets requirements for candidates to seek a teaching endorsement in PK-3, Inclusive Settings, which permits individuals to teach general and special education for children from birth through third grade. Graduates

may be employed by either public or private agencies or schools to teach in early childhood classrooms (preschool through third grade) or in home-based programs.

Students who enroll in the early childhood education – unified program must apply to and be accepted into the teacher education program prior to enrolling in advanced courses.

Additional information is also available from the student's academic advisor.

Students in early childhood education – unified must meet the performance outcome standards for teacher licensure. Standards are assessed in coursework through artifacts such as assignments, projects, or practicum participation. These standards assessments are based on the early childhood content standards for endorsements 1001 and 262 in the State of Iowa. These include competencies in (1) promoting child development, learning and individual learning differences, (2) building family and community relationships, (3) observing, documenting, and assessing to support young children and families, (4) using developmentally and individually effective approaches to connect with children and families, (5) using content knowledge to build a meaningful curriculum, (6) professional responsibilities, and (7) early childhood field experiences. Pre-student teaching field experiences in at least three settings, and student teaching experiences in at least two different settings is required.

### Student Learning Outcomes

Graduates of the Early Childhood Education program will meet the following learning objectives, as defined by the InTASC standards for teacher preparation.

#### Standard 1: Learner Development

The student understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

#### Standard 2: Learning Differences

The student uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

#### Standard 3: Learning Environments

The student works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

#### Standard 4: Content Knowledge

The student understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning

experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

### Standard 5: Application of Content

The student understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

### Standard 6: Assessment

The student understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

### Standard 7: Planning for Instruction

The student plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

### Standard 8: Instructional Strategies

The student understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

### Standard 8A: Technology

The student integrates current and emerging technology in instruction to encourage student creativity, problem solving, collaboration, and digital literacy. Teachers practice and advocate safe, legal, and responsible use of information and technology.

### Standard 9: Professional Learning and Ethical Practice

The student engages in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

### Standard 10: Leadership and Collaboration

The student seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

## Curriculum in Early Childhood Education – Unified Degree Requirements

121 total credits required

### Professional Education core: 15 credits

EDUC 201	Educational Technologies in the PK-6 Classroom **	3
EDUC 205	Social Foundations of Education in the United States: Early Childhood and Elementary Education	3
EDUC 332	Educational Psychology of Early Childhood and Elementary Education **	3

EDUC 405	Social Justice Education and Teaching: Early Childhood and Elementary	3
SP ED 250	Education of the Exceptional Learner **	3
<b>Total Credits</b>		<b>15</b>

\*\*Must receive a "C" or above

### Preprimary Inclusive: 24 credits

HD FS 240	Literature for Children **	3
HD FS 340	Assessment and Curriculum: Ages Birth through 2 Years **	4
HD FS 342	Social and Emotional Development and Child-centered Guidance in Early Childhood **	3
HD FS 343	Assessment and Curriculum: Ages 3 through 6 Years **	4
HD FS 345	Inclusive Teaching and Interaction Strategies **	3
HD FS 455	Curriculum and Interventions: Ages 3 through 6 Years **	4
HD FS 456	Working with Families in Early Intervention **	3
<b>Total Credits</b>		<b>24</b>

\*\*Must receive a "C" or above

### Primary Inclusive: 21 credits

EDUC 245	Landscape of Teaching **	3
EDUC 377	Teaching Literacy in the Primary Grades **	4
EDUC 433	Teaching Social Studies in the Primary Grades **	2
EDUC 438	Teaching Mathematics in the Primary Grades **	2
EDUC 439	Teaching Science in the Primary Grades **	2
EDUC 468F	Pre-Student Teaching Experience III: Primary Grades Inclusive, Literacy **	1
EDUC 468G	Pre-Student Teaching Experience III: Primary Grades Inclusive, Mathematics **	1
EDUC 468I	Pre-Student Teaching Experience III: Primary Grades Inclusive, Science **	1
SP ED 405	Assessment and Instructional Methods in Inclusive Primary Settings (K-3) **	4
SP ED 458	Pre-Student Teaching Experience III: Mild/Moderate Disabilities in Primary Grades (K-3) **	1
<b>Total Credits</b>		<b>21</b>

\*\*Must receive a "C" or above

### Student Teaching \*\*: 16.5 credits

EDUC 416A	Supervised Student Teaching - Elementary: Primary grades (K-3)	8
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HD FS 417C	Supervised Student Teaching: Early Childhood Special Education Programs.	8
HD FS 418A	Professional Practice Reflection/Discussion: Teaching	.5
<b>Total Credits</b>		<b>16.5</b>

\*\*Must receive a "C" or above

### Orientation: 2 credits

HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
HD FS 208	Early Childhood Education Teacher Orientation	1
<b>Total Credits</b>		<b>2</b>

### Human Development and Family Studies: 3 credits

HD FS 224	Development in Young Children: Birth through Age 8 **	3
<b>Total Credits</b>		<b>3</b>

### Communications and Library: 10 credits

ENGL 150	Critical Thinking and Communication **	3
ENGL 250	Written, Oral, Visual, and Electronic Composition **	3
LIB 160	Introduction to College Level Research	1
Communication course from approved general education options list		3
<b>Total Credits</b>		<b>10</b>

\*\*Must receive a "C" or above

### Biological Sciences, Physical Sciences, Mathematics and Health: 14 credits

MATH 195	Mathematics for Elementary Education I *	3
MATH 196	Mathematics for Elementary Education II *	3
H S 105	First Aid and Emergency Care	2
Biological Sciences course from approved general education options list		3
Physical Sciences course from approved general education options list		3
<b>Total Credits</b>		<b>14</b>

\*Must receive a "C-" or above

### Social Sciences: 9 credits

HD FS 102	Human Development	3
One of the following:		3
HIST 221	Survey of United States History I	
HIST 222	Survey of United States History II	
POL S 111	Introduction to American Government	

Social Sciences course from approved ECE list	3
<b>Total Credits</b>	<b>9</b>

### Humanities: 6 credits

Humanities courses from approved ECE list	6
<b>Total Credits</b>	<b>6</b>

### Electives: .5 - 1.5 credits to equal 121 total credits Total Credits: 121

U.S. Diversity and International Perspectives Requirement: Students in early childhood education – unified fulfill the U.S. Diversity and International Perspectives Requirements by choosing three credits of coursework from university-approved Humanities or Social Sciences included on the approved general education options list.

## The courses listed in this section are approved general education course options for this major.

#### Communication Skills: 3 credits

COMST 210	Communication and U.S. Diversity	3
COMST 211	Interpersonal Communication	3
COMST 214	Professional Communication	3
COMST 218	Conflict Management	3
SP CM 212	Fundamentals of Public Speaking	3

**Natural Sciences and Mathematics:** 6 credits. Coursework designed to facilitate students' understanding of the structure and behavior of the natural world, appreciate mathematics as a valuable tool of the sciences, and an intrinsically important way of thinking.

#### Biological Sciences: 3 credits

ANTHR 202	Human Origins	3
BIOL 101	Introductory Biology	3
BIOL 155	Human Biology	3
BIOL 173	Environmental Biology	3
BIOL 211	Principles of Biology I	3
BIOL 255	Fundamentals of Human Anatomy	3

#### Physical Sciences: 3 credits

ASTRO 120	The Sky and the Solar System	3
ASTRO 150	Stars, Galaxies, and Cosmology	3
CHEM 160	Chemistry in Modern Society	3
CHEM 163	College Chemistry ((4 credits))	4
GEOL 100	How the Earth Works	3
GEOL 101	Environmental Geology: Earth in Crisis	3

MTEOR 206	Introduction to Weather and Climate	3
PHYS 101	Physics for the Nonscientist	3
PHYS 102L	Physical Sciences for Elementary Education	3

**Social Sciences:** 9 credits. Coursework designed to help students develop an understanding of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions.

AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AF AM 330	Ethnic and Race Relations	3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	3
A M D 362	Cultural Perspectives of Global Dress	3
A M D 467	Consumer Studies in Apparel and Fashion Products	3
AM IN 310	Contemporary Topics in American Indian Studies	3
AM IN 315	Archaeology of North America	3
AM IN 322	Peoples and Cultures of Native North America	3

Anthropology (ANTHR) - except 202

Economics (ECON)

FS HN 342	World Food Issues: Past and Present	3
HD FS 239	Consumer Issues	3
HD FS 249	Parenting and Family Diversity Issues	3
HD FS 276	Human Sexuality	3
HD FS 360	Housing and Services for Families and Children	3
HD FS 367	Abuse and Illness in Families	3
HD FS 377	Aging and the Family	3
HD FS 395	Children, Families, and Public Policy	3
INTST 235	Introduction to International Studies	3
LING 219	Introduction to Linguistics	3
LING 471	Language and Reading Development in Children	3

Political Science (POL S)

Psychology (PSYCH) - except 131, 332/333

Sociology (SOC), including Criminal Justice (C J)

WGS 201	Introduction to Women's and Gender Studies	3
WGS 203	Introduction to Lesbian Communities	3
WGS 301	International Perspectives on Women and Gender	3
WGS 320	Ecofeminism	3
WGS 327	Gender and Sexualities in Society	3
WGS 328	Sociology of Masculinities and Manhood	3
WGS 346	Psychology of Women	3
WGS 350	Women of Color in the U.S.	3
WGS 385	Women in Politics	3

**Humanities:** 6 credits. Coursework designed to assist students to develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.

AESHM 342	Aesthetics of Consumer Experience	3
AF AM 201	Introduction to African American Studies	3
AF AM 334	Africana Religions	3
AF AM 347	Studies in African American Literature	3
AF AM 353	History of African Americans I	3
AF AM 354	History of African Americans II	3
A M D 257	Museum Studies	3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	3
A M D 356	Euro-American Dress History: Mid-19th Century to the Present	3
AM IN 210	Introduction to American Indian Studies	3
AM IN 240	Introduction to American Indian Literature	3
AM IN 346	American Indian Literature	3
ANTHR 230	Globalization and the Human Condition	3
ANTHR 340	Magic, Witchcraft, and Religion	3
ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 420	Topics in American Architecture	3

Art History (ART H)

Classical Studies (CL ST)

DANCE 270	Dance Appreciation	3
DANCE 360	History and Philosophy of Dance	3

History (HIST) except 221 or 222

HSP M 260	Global Tourism Management	3
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Literature (ENGL) except 205

MUSIC 102	Introduction to Music Listening	3
MUSIC 302	Masterpieces of Music and Art in Western Culture.	3
MUSIC 304	History of American Rock 'n' Roll	3
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3

Philosophy (PHIL)

Religious Studies (RELIG)

THTRE 106	Introduction to the Performing Arts	3
THTRE 110	Theatre and Society	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
US LS 211	Introduction to U.S. Latino/a Studies	3
WGS 201	Introduction to Women's and Gender Studies	3
WGS 336	Religion, Sex and Gender	3

WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
WGS 370	Studies in English Translation	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3
WGS 386	History of Women in America	3

World Languages and Cultures (ARABC, CHIN, FRNCH, GER, GREEK, RUS, SPAN)

## Early Childhood Education - Unified, B.S.

### Freshman

Fall	Credits Spring	Credits
HD FS 102	3 HD FS 208	1
HD FS 110 or 111	1 Humanities Option*	3
LIB 160	1 HIST 221 or 222	3
EDUC 205	3 MATH 195	3
ENGL 150	3 SP ED 250	3
Humanities Option*	3 Social Sciences Option*	3
PSYCH 131 (recommended elective)	1	
	<b>15</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
MATH 196	3 EDUC 245	3
ENGL 250	3 EDUC 332	3
EDUC 201	3 HD FS 224	3
Physical Sciences Option*	3 Biological Sciences Option*	3
HD FS 240	3 Communication Option*	3
	Apply to Educator Preparation program	
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
EDUC 377 <sup>B</sup>	4 EDUC 433 <sup>B</sup>	2
EDUC 438 <sup>B</sup>	2 EDUC 439 <sup>B</sup>	2
EDUC 468F <sup>B</sup>	1 EDUC 468I <sup>B</sup>	1
EDUC 468G <sup>B</sup>	1 SP ED 405 <sup>B</sup>	4
HD FS 340	4 SP ED 458 <sup>B</sup>	1
HD FS 345	3 HD FS 342	3
Finalize Degree Audit	HD FS 343	4
	<b>15</b>	<b>17</b>

### Senior

Fall	Credits Spring	Credits
HD FS 455	4 EDUC 416A <sup>B</sup>	8
HD FS 456	3 HD FS 417C <sup>B</sup>	8
EDUC 405	3 HD FS 418A	.5
H S 105	2	
Electives, if needed to equal 121 total credits	.5-3	
Take Praxis II prior to Licensing		
Apply to graduate		
Apply to student teaching		
	<b>12.5-15</b>	<b>16.5</b>

This sheet provides a guide to the sequence of HD FS and EDUC courses; courses adhere to a prescribed sequence of semesters. Your academic advisor will help you develop an individual long range plan.

B Block of courses listed together in the semester must be taken concurrently as sequenced

\* See approved general education options list of courses for courses in Biological Sciences, Humanities, Physical Sciences and Social Sciences

ISU requires a 3 credit U.S. Diversity course (satisfied by HD FS 240) and a 3 credit international perspective course (usually met through a University approved humanities or social science options from the approved general education options list).

## Education Secondary Secondary Major in Education

A secondary major in Education at Iowa State University prepares candidates to teach at the middle school and high school levels. K-12/Secondary Educator Preparation Programs eligible to pursue the secondary major in Education are:

- English Education
- History/Social Sciences Education - History
- History/Social Sciences Education - Political Science
- Mathematics Education
- Science Education – Biology
- Science Education – Chemistry
- Science Education – Earth Science
- Science Education – Physics
- World Languages and Cultures Education – French



- World Languages and Cultures Education – German
- World Languages and Cultures Education – Spanish

## Additional Endorsements and Minors

Candidates pursuing the secondary major in Education have the opportunity to pursue additional endorsements and minors:

- K-12 Coaching Endorsement
- K-12 English as a Second Language Endorsement
- 5-12 Reading Endorsement
- Additional Science Endorsements
  - 5-12 Basic Science
- Additional Social Sciences Endorsements
  - 5-12 American Government
  - 5-12 Anthropology
  - 5-12 Economics
  - 5-12 Psychology
  - 5-12 Sociology
- Learning Technologies Minor  
(See <https://education.iastate.edu/find-your-major/learning-technologies-minor/>)

Specific program requirements can be found within each department that houses the endorsement. Information on K-12 Coaching, K-12 English as a Second Language, 5-12 Reading, and K-12 Speech and Theatre can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catyr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catyr2jqf/>)

## Student Learning Outcomes

Upon graduation, students should be able to:

### The Learner and Learning

Standard #1: Learner Development.

Understand how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

Standard #2: Learning Differences.

Use understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

Standard #3: Learning Environments.

Work with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

### Content

Standard #4: Content Knowledge.

Understand the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

Standard #5: Application of Content.

Understand how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

### Instructional Practices

Standard #6: Assessment.

Understand and use multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

Standard #7: Planning for Instruction.

Plan instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

Standard #8: Instructional Strategies.

Understand and use a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

Standard #8A: Technology.

Integrate current and emerging technology in instruction to encourage student creativity, problem solving, collaboration, and digital literacy.

Teachers practice and advocate safe, legal, and responsible use of information and technology.

### Professional Responsibility

Standard #9: Professional Learning and Ethical Practice.

Engage in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

Standard #10: Leadership and Collaboration.

Seek appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

## Curriculum in Secondary Major in Education

### Educator Preparation Program Admission Requirements

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehixel2epxtekxax/>)

In order to be eligible to student teaching (EDUC 417), candidates must have completed all degree program requirements and content specific coursework.

- Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphappmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer.

- Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

All Educator Preparation Program candidates must complete the professional core coursework (information found under each program) and required pedagogy and field experience coursework for their program. In addition, all prospective teachers are required to meet general education requirements as a part of their preparation. They must complete studies in the following general education groups. General education courses may be found in many departments. Credits listed are minimum requirements. Specific departments and/or colleges may require specific coursework to meet these requirements or additional credits. Credits used to satisfy these general education requirements typically satisfy department and college general education requirements.

### Educator Preparation General Education Requirements

Natural Sciences	6
Mathematics or Statistics	3
Social Sciences	9
Humanities	6

Communication Skills	Must include ENGL 150 and 250 or an equivalent	9
Library Skills	LIB 160	1
HD FS 102 or PSYCH 230		3
One course in American history or government		
One course that develops interpersonal or group presentation skills		

**NOTE: Specific majors will provide approved options to meet these requirements.**

## Secondary major in Education Requirements for English, Social Sciences, Mathematics, World Languages, and Science Education Candidates

### Educator Preparation Field Experiences:

EDUC 280L	Pre-Student Teaching Experience I: Secondary Education	0.5
EDUC 380A	Pre-Student Teaching Experience II: Core Experience	2
EDUC 417	Student Teaching	16
EDUC 480	Pre-Student Teaching Experience III	2

### Educator Preparation Professional Core Coursework:

EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 204	Social Foundations of Education in the United States: Secondary	3
EDUC 219	Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors	1
EDUC 333	Educational Psychology	3
EDUC 395	Teaching Disciplinary Literacy	3
EDUC 406	Social Justice Education and Teaching: Secondary	3
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3

**Please check departmental information in regards to specific content and methods coursework.**

## Elementary Education

A degree in elementary education at Iowa State prepares you to teach all subjects at the elementary school level (grades K-6). Program completers can be recommended for licensure to the Iowa Board of Education Examiners.

In addition to pursuing a degree in Elementary Education, candidates are required to pursue an endorsement in at least one additional area. Candidates will be prepared to teach students in grades kindergarten through eighth grade in this area of specialization. Endorsements in the following areas are available for elementary education majors:

- K-8 English/Language Arts & Reading
- K-12 English as a Second Language (ESL)
- K-8 Health
- K-8 Mathematics
- K-8 Science
- K-8 Social studies
- K-8 Special education (Instructional Strategist I: Mild/Moderate Disabilities K-8)

In addition, candidates can choose to pursue endorsements in K-8 Reading, K-12 Coaching, and 5-8 Algebra for HS Credit.

Additional information about endorsements can be found at: <https://www.education.iastate.edu/find-majors/elementary-education/>

## Student Learning Outcomes

Upon graduation, students should be able to:

### The Learner and Learning

Standard #1: Learner Development.

Understand how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

Standard #2: Learning Differences.

Use understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

Standard #3: Learning Environments.

Work with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

### Content

Standard #4: Content Knowledge.

Understand the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

Standard #5: Application of Content.

Understand how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

## Instructional Practices

Standard #6: Assessment.

Understand and use multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

Standard #7: Planning for Instruction.

Plan instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

Standard #8: Instructional Strategies.

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Standard #8A: Technology.

Integrate current and emerging technology in instruction to encourage student creativity, problem solving, collaboration, and digital literacy.

Teachers practice and advocate safe, legal, and responsible use of information and technology.

## Professional Responsibility

Standard #9: Professional Learning and Ethical Practice.

Engage in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

Standard #10: Leadership and Collaboration.

Seek appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

Curriculum in Elementary Education

## Educator Preparation Program Admission Requirements

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehixe12epxtekkax/>)

## Degree Requirements

120 total credits minimum required

### Communications and Library: 10 credits

ENGL 150	Critical Thinking and Communication **	3
ENGL 250	Written, Oral, Visual, and Electronic Composition **	3
LIB 160	Introduction to College Level Research	1
Communication course from approved Elementary Education list *		3
<b>Total Credits</b>		<b>10</b>

\*Must receive a "C-" or above

\*\*Must receive a "C" or above

### Social Sciences: 9 credits

PSYCH or SOC	Option from approved Elementary Education list *	3
Social Sciences course from approved Elementary Education list *		3
Social Sciences course from approved Elementary Education list *		3
<b>Total Credits</b>		<b>9</b>

\*Must receive a "C-" or above

### Humanities: 6 credits

HIST 221	Survey of United States History I *	3
or HIST 222	Survey of United States History II	
Humanities courses from approved Elementary Education list *		3

\*Must receive a "C-" or above

### Mathematics: 9 credits

MATH 195	Mathematics for Elementary Education I *	3
MATH 196	Mathematics for Elementary Education II *	3
Math Option from approved Elementary Education list *		3
<b>Total Credits</b>		<b>9</b>

\*Must receive a "C-" or above

### Biological Sciences, Physical Sciences, Earth/Space Sciences: 9 credits

Biological Sciences course from approved Elementary Education list *		3
Physical Sciences course from approved Elementary Education list *		3

Earth/Space Sciences course from approved Elementary Education list \*

**Total Credits** **9**

\*Must receive a "C-" or above

### Orientation and Initial Field Experience: 2 credits

EDUC 216	Learning Community Orientation to Teacher Education	1
or EDUC 315	Transfer Orientation	
EDUC 280N	Pre-Student Teaching Experience I: Elementary Education	1
or EDUC 280T	Pre-Student Teaching Experience I: Tutoring	

**Total Credits** **2**

### Professional Education Core: 21 credits

EDUC 201	Educational Technologies in the PK-6 Classroom **	3
EDUC 205	Social Foundations of Education in the United States: Early Childhood and Elementary Education **	3
SP ED 250	Education of the Exceptional Learner **	3
EDUC 245	Landscape of Teaching **	3
HD FS 102	Human Development **	3
or PSYCH 230	Developmental Psychology	
EDUC 332	Educational Psychology of Early Childhood and Elementary Education **	3
HD FS 240	Literature for Children **	3
<b>Total Credits</b>		<b>21</b>

\*\*Must receive a "C" or above

### Block I: Literacy and Mathematics Methods and Social Justice Education: 12 Credits

EDUC 377	Teaching Literacy in the Primary Grades **	4
EDUC 405	Social Justice Education and Teaching: Early Childhood and Elementary **	3
EDUC 448	Teaching Children Mathematics **	3
EDUC 468A	Pre-Student Teaching Experience III: Primary Grades, Reading and Language Arts	1
EDUC 468C	Pre-Student Teaching Experience III: Primary Grades, Mathematics	1
<b>Total Credits</b>		<b>12</b>

\*\*Must receive a "C" or above

**Block II: Literacy, Science, and Social Studies Methods: 12 credits**

EDUC 378	Teaching Literacy in the Intermediate Grades **	4
EDUC 443	The Teaching of Social Studies **	3
EDUC 449	The Teaching of Science **	3
EDUC 468B	Pre-Student Teaching Experience III: Intermediate Grades, Reading and Language Arts	1
EDUC 468D	Pre-Student Teaching Experience III: Intermediate Grades, Science	1
<b>Total Credits</b>		<b>12</b>

\*\*Must receive a "C" or above

**Related Methods: 7 credits**

KIN 284	Elementary and Pre-school Movement Education **	3
or H S 275	Health Education in the Elementary School	
MUSIC 265	Music in Elementary Education **	2
ARTED 209	Methods of Teaching in and Through Art **	2
<b>Total Credits</b>		<b>7</b>

\*\*Must receive a "C" or above

**Primary Endorsement Area: Credits Vary**

Minimum grade of a "C" required for all EDUC, HD FS, and SP ED courses and all content-specific pedagogy/methods courses. Minimum grade of "C-" required for all other courses in endorsement areas.

**Primary Endorsement Options:**

- K-8 English/Language Arts & Reading
- K-12 English as a Second Language (ESL)
- K-8 Health
- K-8 Mathematics
- K-8 Science
- K-8 Social studies
- K-8 Special education (Instructional Strategist I: Mild/Moderate Disabilities K-8).

Additional information about endorsements can be found at <https://www.education.iastate.edu/find-majors/elementary-education/>

**Student Teaching: 16 credits**

EDUC 416A	Supervised Student Teaching - Elementary: Primary grades (K-3) **	8
EDUC 416B	Supervised Student Teaching - Elementary: Intermediate grades (3-6) **	8
<b>Total Credits</b>		<b>16</b>

\*\*Must receive a "C" or above

**Total Credits: 122 minimum credits (credits will vary depending on endorsement option)**

U.S. Diversity and International Perspectives Requirements: Students in elementary education fulfill the U.S. Diversity and International Perspectives requirements by choosing three credits of coursework from university-approved Humanities or Social Sciences courses included on the Elementary Education approved options sheet.

**Additional Endorsement**

Candidates can pursue any of the primary endorsement areas listed above and in the following areas:

- K-8 Reading
- K-12 Coaching
- 5-8 Algebra for HS Credit

Information about these endorsements can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf/>)  
Contact an Elementary Education academic advisor for additional information.

**Educator Preparation Program Completion Requirements:**

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an Educator Preparation Program Completer. Access the policy: Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

**Elementary Education, B.S.****First Year**

Fall	Credits Spring	Credits
EDUC 205	3 EDUC 280N	1
EDUC 216	1 SP ED 250	3
PSYCH 230 or HD FS 102	3 MATH 195	3
ENGL 150	3 HIST 221 or 222	3
LIB 160	1 Science Option 1	3
Social Science Option	3 PSYCH or SOC Option	3
<b>14</b>		<b>16</b>

**Second Year**

Fall	Credits Spring	Credits
EDUC 201	3 EDUC 245	3
HD FS 240	3 EDUC 332	3
ENGL 250	3 Biological Science Option 3	3
MATH 196	3 Math Option	3
Science Option 2	3 Endorsement Area	3

### Apply/Accepted to Educator Preparation Program

	<b>15</b>	<b>15</b>
<b>Third Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Block I	Block II	
EDUC 377	4 EDUC 378	4
EDUC 405	3 EDUC 443	3
EDUC 448	3 EDUC 449	3
EDUC 468A	1 EDUC 468B	1
EDUC 468C	1 EDUC 468D	1
Social Science Option	3 Endorsement Area	3
	<b>15</b>	<b>15</b>
<b>Fourth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ARTED 209	2 Student Teaching:	
KIN 284 or H S 275	3 EDUC 416A	8
MUSIC 265	2 EDUC 416B	8
Communications Option	3	
Humanities Option/ Endorsement Area	6	
Apply for Graduation		
	<b>16</b>	<b>16</b>

Total Credits: 122 and above

*It is our expectation that students know the requirements of their academic program and develop and follow an academic plan based on their academic catalog and degree audit using their individual academic advisor as a resource in this process.*

## Event Management

Administered by the Department of Apparel, Events, and Hospitality Management.

The program offers study for the degree of Bachelor of Science with a major in event management. The program prepares undergraduate students for careers in leading event and meeting management businesses. To complete the program, a student combines general education, Event core classes, and a structure of focused courses to form an option in: (a) corporate/business events, (b) virtual events, (c) social events: weddings and nonprofit events, (d) sport events, or (e) innovative event experiences in retail.

Through the major, students gain background and experiences in planning, budgeting, and implementing conferences, meetings, and other special events in the public or private sectors. Course work

provides students with a general education plus professional preparation focusing on the concepts and principles involved in meeting and event planning strategy; special event management; stakeholder development; budgets and finance; site selection; contracts, vendors, and negotiations; marketing and promotions; food and beverage management; meeting technology; event evaluation; and hospitality law. Event electives include courses in event sustainability, event digital promotion, incentive meetings, and international conference planning. Supporting courses include foodservice, catering, promotion, brand management, trend analysis, fashion, and resource management.

The program also houses "The Meeting Room: Where Experiences and Technology Innovate," a lab designed to allow Event Management students to have hands-on access to a number of cutting-edge technology tools designed to let students focus on new and event disruptive ideas in events and meeting management. The lab is equipped with virtual reality headsets, event sound and lighting equipment, wireless connectivity to displays for BYOD, and group/collaboration furniture.

Graduates from this program are prepared for careers in event planning (corporate events, celebrations, education, promotions, commemorations, trade shows, weddings, conferences, association events, exhibitions, festivals, philanthropies, entertainment, fundraising, conventions, and sport events) and small business development (entrepreneurship). Graduates demonstrate leadership characteristics and make decisions based on integrating knowledge of financial, human resources, promotion, and event management principles. Students are required to complete an internship in event management prior to graduation. The student experience is enhanced through networking and development events with our Event Management Executive Advisory Council, meeting/event industry conferences and association meetings, and international experiences designed specifically for event management students.

### Leading to the degree Bachelor of Science

Total credits required: 123, including a minimum of 18 credits from the AESHM Department at Iowa State University for the degree.

The curriculum in event management prepares students for careers in leading event and meeting management businesses. Courses are required in general education, and the professional area. Students majoring in Event Management are required to earn C- or better in all AESHM and EVENT courses, and all courses in the EVENT Core.

Communication Proficiency Requirement: Grade of C or better in ENGL 150 Critical Thinking and Communication, and ENGL 250 Written, Oral, Visual, and Electronic Composition.

### Student Learning Outcomes

Upon graduation, students should be able to:



1. *Communication.* Use clear and effective written, oral, verbal and electronic (WOVE) communication techniques to foster inquiry, collaboration, and engagement in apparel and related industries.
2. *Self-assessment/self-reflection.* Analyze and evaluate one's own knowledge, abilities, and actions relative to professional standards, seek opportunities to grow professionally, and utilize self-assessment and assessment of others to foster psychological, cognitive, social and emotional well-being.
3. *Critical thinking.* Understand fundamental concepts of event management and apply critical thinking to solve problems from personal, scholarly, and professional perspectives.
4. *Ethics, Diversity, and Social Responsibility.* Demonstrate leadership and social justice to improve quality of life for global citizens and encourage socially responsible decision-making for consumers and businesses.

## Curriculum in Event Management

Administered by the Apparel, Events, and Hospitality Management Department.

Leading to the degree Bachelor of Science.

Total credits required: 123 including a minimum of 18 credits from the AESHM Department at Iowa State University for the degree. The curriculum in event management prepares students for careers in leading event and meeting management businesses. Courses are required in general education, and the professional area. Students majoring in Event Management are required to earn C- or better in all AESHM and EVENT courses, and all courses in the EVENT Core. Communication Proficiency Requirement: Grade of C or better in ENGL 150 Critical Thinking and Communication, and ENGL 250 Written, Oral, Visual, and Electronic Composition.

A minor in event management is available; see requirements under Apparel, Events, and Hospitality Courses and Programs.

### Cr. Degree Requirements

#### 13 Communication Skills

ENGL 150	Critical Thinking and Communication *	3
ENGL 250	Written, Oral, Visual, and Electronic Composition *	3
ENGL 302	Business Communication	3
LIB 160	Introduction to College Level Research	1
Select from:		3
COMST 211	Interpersonal Communication	
COMST 214	Professional Communication	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>13</b>

#### 9-10 Natural Sciences and Mathematical Disciplines

Select from: 3

MATH 104	Introduction to Probability
MATH 105	Introduction to Mathematical Ideas
MATH 140	College Algebra
MATH 143	Preparation for Calculus
MATH 150	Discrete Mathematics for Business and Social Sciences
MATH 160	Survey of Calculus

Select from: 3-4

STAT 101	Principles of Statistics
STAT 104	Introduction to Statistics

Natural Sciences 3

Select from: Astronomy, Biology, Biochemistry, Chemistry, Ecology, Entomology, Environmental Science, Environmental Studies, Food Science and Human Nutrition 101, 111, 115, or 167, Genetics, Geology, Meteorology, Horticulture, Microbiology, Physics or A M D 204

**Total Credits** 9-10

#### 9 Social Sciences

ECON 101 Principles of Microeconomics 3

Select from: 6

A M D 165	Dress, Appearance, and Diversity in U.S. Society
ECON 102	Principles of Macroeconomics
HD FS 102	Human Development
POL S 111	Introduction to American Government
PSYCH 101	Introduction to Psychology
PSYCH 230	Developmental Psychology
PSYCH 280	Social Psychology
SOC 134	Introduction to Sociology

**Total Credits** 9

#### 6 Humanities

AESHM 342 Aesthetics of Consumer Experience 3

World Languages and Cultures (Foreign Language) course suggested 3

OR courses from African and African American Studies, American Indian Studies, Anthropology, Art History, Classical Studies, DSN S 183, History, INTST 235, Literature, Philosophy, Religious Studies, Music or Dance Appreciation, Women and Gender Studies, Theater

**Total Credits** 6

**9-13 General Electives****33 EVENT Core Courses**

EVENT 171	Introduction to Event Management	3
EVENT 212	Digital Production in Event Management	3
EVENT 277	Introduction to Digital Promotion in Event Management	3
EVENT 343X	Virtual and Hybrid Events	3
EVENT 367	Event Sales	3
EVENT 371	Conference and Meeting Planning	3
EVENT 471	Special Events Coordination	3
EVENT 485	Event Production	3
AESHM 470F	Supervised Professional Internship: Event Management	3-6
ACCT 284	Financial Accounting	3
HSP M 315	Hospitality Law	3

**Total Credits** **33-36**

**15 AESHM Professional Development**

AESHM 111	Professional Development for AESHM	1
AESHM 111L	AESHM Program Orientation and Learning Community	1
AESHM 211	Leadership Experiences and Development (LEAD) (Remove AESHM 211)	3
AESHM 238	Human Resource Management	3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 311E	Seminar on Careers and Internships: Event Management and Hospitality Management	1
AESHM 340	Hospitality and Apparel Marketing Strategies	3

**Total Credits** **15**

**9 Event Management Elective Courses**

EVENT 328	Incentive Meeting Management	3
EVENT 333	Entertainment Venue Management	3
EVENT 373	Wedding Planning and Management	3
EVENT 378	Sustainable Event Management	3
EVENT 379	Nonprofit Fundraising Event Planning	3
EVENT 383	Sports Event Management	3
EVENT 393	Event Management Workshop	1-3
EVENT 423	International Meetings and Conferences Management	3
EVENT 486	Advanced Event Production	3
AESHM 170	Supervised Work Experience I	1
AESHM 180E	First Year Student Field Study: Hospitality and Event Management	2
AESHM 270F	Supervised Work Experience II: Event Management	2

AESHM 272	Fashion Show Production and Promotion	2
AESHM 281	Orientation to International Field Study	1
AESHM 345X	Retail/Hospitality Experience & Events	1-3
AESHM 381	International Field Study	1-3
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AESHM 470F	Supervised Professional Internship: Event Management	3-6
AESHM 472	Fashion Show Management	2-3
AESHM 474	Entrepreneurship in Human Sciences	3
A M D 275	Retail Merchandising	3
A M D 377	Visual Presentation and Promotions	3
HSP M 101	Introduction to the Hospitality Industry	3
HSP M 133	Food Safety Certification	1
HSP M 225	Introduction to Food Service Operations	3
HSP M 260	Global Tourism Management	3
HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 289	Contemporary Club Management	3
HSP M 320	Attractions and Amusement Park Administration	3
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
HSP M 383	Wine and Spirits in Hospitality Management	2
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	2
HSP M 385	Beer and Brewed Beverages in Hospitality Management	1
HSP M 393CX	Workshop: Innovations in Chocolate I	2
HSP M 420	Fairs and Festivals Management	3
HSP M 437	Hospitality Technology Applications	3
HSP M 487	Fine Dining Management	3
HORT 131	Floral Design	2
HORT 132	Wedding and Event Floral Design	2
JL MC 307	Digital Video Production	3
JL MC 406	Media Management	3
KIN 345	Management of Health-Fitness Programs and Facilities	3
KIN 365	Sport Psychology	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
SCM 301	Supply Chain Management	3

**Primary Options:**

Select one professional primary option from the following five choices:

**CORPORATE/BUSINESS EVENTS (15 cr.)**

EVENT 328	Incentive Meeting Management	3
EVENT 378	Sustainable Event Management	3
EVENT 486	Advanced Event Production	3
AESHM 474	Entrepreneurship in Human Sciences	3
AESHM 479X	Data Analytics for Apparel, Events, and Hospitality Management	3

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**Total Credits** **15**
**SOCIAL EVENTS: WEDDINGS AND NONPROFIT EVENTS (15 cr.)**

EVENT 333	Entertainment Venue Management	3
EVENT 373	Wedding Planning and Management	3
EVENT 378	Sustainable Event Management	3
EVENT 379	Nonprofit Fundraising Event Planning	3
AESHM 474	Entrepreneurship in Human Sciences	3
A M D 377	Visual Presentation and Promotions	3

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**Total Credits** **18**
**SPORTS EVENTS (15 cr.)**

EVENT 333	Entertainment Venue Management	3
EVENT 383	Sports Event Management	3
HSP M 101	Introduction to the Hospitality Industry	3
HSP M 289	Contemporary Club Management	3
KIN 345	Management of Health-Fitness Programs and Facilities	3

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**Total Credits** **15**
**INNOVATIVE EVENT EXPERIENCES IN RETAIL (15 cr.)**

AESHM 345X	Retail/Hospitality Experiences & Events	3
AESHM 474	Entrepreneurship in Human Sciences	3
AESHM 479X	Data Analytics for Apparel, Events, and Hospitality Management	3
A M D 275	Retail Merchandising	3
A M D 377	Visual Presentation and Promotions	3

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**Total Credits** **15**
**Event Management, B.S.****Freshman**

Fall	Credits	Spring	Credits
AESHM 111		1 ECON 101	3
AESHM 111L		1 ENGL 250	3
ENGL 150		3 LIB 160	1
EVENT 171		3 Humanities	3
		"Select from" Course	

HSP M 101	3 Natural Sciences	3
	"Select from" Course	

Social Science	3 AESHM 211	3
"Select from" Course		

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**14** **16**
**Sophomore**

Fall	Credits	Spring	Credits
AESHM 287		3 AESHM 340	3
EVENT 212		3 AESHM 238	3
Event Management Electives course		3 ACCT 215 or HSP M 315	3

Math	3 EVENT 371	3
"Select from" Course		

Social Science	3 Course #1 towards "Option"	3
"Select from" Course		

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HSP M 133 1

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**15** **16**
**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
AESHM 311		1 EVENT 471		3 AESHM 470F	3
ACCT 284		3 EVENT 485			3
AESHM 342		3 Course #3 towards "Option"			3

EVENT 367	3 STAT 101 or 104	3-4
Course #2 towards "Option"	3 Event Management Electives course	3

General	2			
Elective				
Course				
	<b>15</b>	<b>15-16</b>	<b>3</b>	
<b>Senior</b>				
<b>Fall</b>	<b>Credits</b>	<b>Spring</b>	<b>Credits</b>	
Course #4	3	Course #5	3	
towards		towards		
"Option"		"Option"		
HSP M 260	3	Speech/	3	
		Communication		
		'Select		
		from'		
		course		
General	3	Event	3	
Elective		Management		
Course		Electives		
		course		
Event	2	General	5-6	
Management		Elective		
Electives		course		
course				
EVENT	3			
343X				
Virtual				
and Hybrid				
Events				
	<b>14</b>	<b>14-15</b>		

**Total Credits: 122-124**

## Event Management Minor

The AESHM Department offers a minor in Event Management. The minor can be earned by successfully completing the following for a total of 15 credits. The minor must include at least six (6) credits in courses numbered 300 or above taken at ISU. All course prerequisites must be completed prior to taking the course. All minor courses must be taken for a grade. The Event Management Minor requires students to complete EVENT 171, EVENT 371, and EVENT 471. The remaining 6 credits may be selected from any courses listed below. \*\*Only 12 total credits of EVENT classes can apply to the minor.

9 credits are required:

EVENT 171	Introduction to Event Management	3
EVENT 371	Conference and Meeting Planning	3
EVENT 471	Special Events Coordination	3

And 6 credits of the following: (only 1 additional course designated "EVENT" can apply towards your minor)

EVENT 277	Introduction to Digital Promotion in Event Management	3
EVENT 328	Incentive Meeting Management	3
EVENT 333	Entertainment Venue Management	3
EVENT 373	Wedding Planning and Management	3
EVENT 378	Sustainable Event Management	3
EVENT 379	Nonprofit Fundraising Event Planning	3
EVENT 383	Sports Event Management	3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 340	Hospitality and Apparel Marketing Strategies	3
AESHM 342	Aesthetics of Consumer Experience	3
AESHM 472	Fashion Show Management	2-3
AESHM 474	Entrepreneurship in Human Sciences	3
HSP M 289	Contemporary Club Management	3
HSP M 320	Attractions and Amusement Park Administration	3
HSP M 437	Hospitality Technology Applications	3
P R 220	Principles of Public Relations	3

## Event Management Master's Program

Event Management Core (required)

AESHM 501	Introduction to Scholarly Research for Graduate Students	1
EVENT 531	Event Business Research Essentials	3
EVENT 561	Advanced Topics in Event Management	3
EVENT 577	Advanced Social Media Marketing in Event Management	3
EVENT 578	Advanced Event Sustainability Management	3
EVENT 599	Creative Component	3
EVENT 634	Theory and Research Seminar in Event Management	3

**Total Credits 19**

AESHM Electives

Select three (3) courses from:

A M D 545	Consumer Experience and Retail Branding	3
AESHM 574	Entrepreneurship in Human Sciences	3
AESHM 579X	Data Analytics for Apparel, Event, and Hospitality Management	3
AESHM 580	U.S. Field Study	1-3
AESHM 581	International Field Study	1-3
AESHM 670	Teaching Practicum	1-3

A M D 545	Consumer Experience and Retail Branding	3
A M D 565	Sustainability: Theory and Practical Application	3
A M D 567	Consumer Behavior and Apparel	3
A M D 577	E-Commerce for Apparel and Hospitality Companies	3
EVENT 590	Special Topics	3
HSP M 533	Financial Decision Making in Hospitality Organizations	3
HSP M 538	Human Resources Development in Hospitality Organizations	3
HSP M 540	Strategic Marketing	3
HSP M 555	Strategic Management in Hospitality Organizations	3
HSP M 560	Tourism Management and Tourist Behavior	3

#### Research Methods and Statistics

Select two (2) courses from

AESHM 502	Research Methods in Apparel, Events, and Hospitality	3
AESHM 510	Quantitative Research Methods in Apparel, Events, and Hospitality	3
AESHM 512	Qualitative Research Methods in Apparel, Events, and Hospitality	3
RESEV 550	Introduction to Educational Research	3
RESEV 552	Basic Educational Statistics	3
RESEV 580	Introduction to Qualitative Research Methodology	3
STAT 587	Statistical Methods for Research Workers	4

## Family and Consumer Sciences Education and Studies

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science.

The curriculum in Family and Consumer Sciences Education and Studies (FCEDS) prepares graduates with a broad understanding of individual and family well-being. Graduates apply knowledge and research in human sciences content in global professional settings. They work in an integrative fashion to improve well-being by addressing and acting on complex problems confronting individuals, families, and communities. Ours is an interdisciplinary major where students take coursework in content areas including human development, early childhood education, interpersonal relationships, family studies, culinary arts, nutrition, textiles, interior design, and financial planning. This unique program of study integrates multiples facets of human health and well-being, preparing

FCEDS graduates to support individuals, families, and communities in diverse settings to achieve optimal quality of life.

### Student Learning Outcomes

Graduates of the Family & Consumer Sciences Education program will be meet the following learning objectives, as defined by the InTASC standards for teacher preparation.

#### Standard 1: Learner Development

The student understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

#### Standard 2: Learning Differences

The student uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

#### Standard 3: Learning Environments

The student works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

#### Standard 4: Content Knowledge

The student understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

#### Standard 5: Application of Content

The student understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

#### Standard 6: Assessment

The student understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

#### Standard 7: Planning for Instruction

The student plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

#### Standard 8: Instructional Strategies

The student understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

**Standard 8A: Technology**

The student integrates current and emerging technology in instruction to encourage student creativity, problem solving, collaboration, and digital literacy. Teachers practice and advocate safe, legal, and responsible use of information and technology.

**Standard 9: Professional Learning and Ethical Practice**

The student engages in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

**Standard 10: Leadership and Collaboration**

The student seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

Students in the curriculum choose one of three options: Teacher Licensure, Professional Studies, or Communications.

Graduates of the Teacher Licensure option may teach family and consumer sciences in middle, junior high, and senior high schools. Students who enroll in Teacher Licensure must apply and be accepted into the educator preparation program prior to enrolling in advanced courses. This program option is approved by the Iowa Department of Education for the preparation of comprehensive and occupational career and technical education family and consumer sciences teachers.

Graduates of the Professional Studies option are prepared to work in a variety of careers including Extension & Outreach, non-profit organizations, and governmental agencies as well as within the private business or entrepreneurial sector.

Graduates of the Communications option have the ability to educate consumers in a global and technologically changing society. Students apply the principles of educational presentations, journalism, marketing, and public relations to empower people to critically analyze options and make the best choices for their needs.

Students in FCEDS may choose coursework that leads to becoming a Certified Family Life Educator (CFLE), a program that has been approved by the National Council on Family Relations. These courses provide the basic education for students interested in working with families, including adolescents, parents, or adults working to strengthen relationships. The student takes courses that support the development of knowledge and skills in family life content areas selected by the National Council on Family Relations. The certification is a voluntary credential that requires the individual to complete a degree in an approved program and to have at least two years of work experience in family life education settings. Iowa State University does not grant the Certified Family Life Educator credential. The certification is granted only by the National Council on

Family Relations. See <https://hdfs.hs.iastate.edu/future-students/find-your-major/certified-family-life-educator/> and/or <http://www.ncfr.org/cfle-certification> (<http://www.ncfr.org/cfle-certification/>).

Graduates may also choose from one of several nationally recognized professional certifications available from the American Association of Family and Consumer Sciences (AAFCS) Council for Certification. This program measures competencies of FCS professionals using high-quality, rigorous assessments. Certifications that are currently available are (<https://www.aafcs.org/home> (<https://www.aafcs.org/home/>)): **CFCS**: Certified in Family and Consumer Sciences; **CFCS-HDFS**: Certified in Human Development and Family Studies; **CFCS-HNFS**: Certified in Hospitality, Nutrition, and Food Science; and **CPFFE**: Certified Personal and Family Finance Educator.

There is also an opportunity to take courses that will allow you to be recommended for a family and consumer sciences-general endorsement or teacher licensure as a post baccalaureate student.

Communication Proficiency Requirement: A student must achieve a grade of C or higher in ENGL 150, Critical Thinking and Communication, and ENGL 250, Written, Oral, Visual, and Electronic Composition. A student achieving a grade of C- or lower in 150 and/or 250 must either repeat the course(s), earning a minimum grade of C, or, in consultation with the advisor and the coordinator of freshman English, complete another appropriate English writing course with a minimum grade of C.

A minor in Educational Services in Family and Consumer Sciences is available, see requirements under Undergraduate Minor.

## Curriculum in Family and Consumer Sciences Education and Studies

Administered by the Department of Human Development and Family Studies. Leading to a degree bachelor of science.

This curriculum provides a broad-based program of study focusing on preparation for professional careers related to education or community leadership. Courses are required in general education and the College core.

Students in the program choose one of three options: Teacher Licensure, Communications, or Professional Studies.

Option 1, **Teacher Licensure**, is designed for students seeking careers as family and consumer sciences educators in a variety of settings such as middle, junior high, and senior high schools. Further information about educator preparation programs appears under Teacher Education in the School of Education.

Option 2, **Communications**, is designed for students seeking careers emphasizing the use of principles in journalism, marketing, communications, and public relations with diverse populations in



business or social agency settings as well as extension, community agencies, community colleges, and youth and adult education programs in the global community.

Option 3, **Professional Studies**, is designed to provide students with the opportunity to pursue an individualized program which is planned with their academic advisors. Careers include working with diverse populations in Extension, business, community agencies, and community colleges, or non-profit groups and organizations involving youth and adult education programs.

### Option 1: Teacher Licensure

Total Credits for FCEDS (Teacher Licensure): 123

#### Family and Consumer Sciences Education and Studies Core: 22 credits

HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
FCEDS 206	Professional Roles in Family and Consumer Sciences **	2
FCEDS 306	Educational Principles for Family and Consumer Sciences	4
FS HN 167	Introductory Human Nutrition and Health	3
HD FS 249	Parenting and Family Diversity Issues	3
or HD FS 224	Development in Young Children: Birth through Age 8	
HD FS 276	Human Sexuality *	3
HD FS 283	Personal and Family Finance *	3
or HD FS 239	Consumer Issues	
<b>Total Credits</b>		<b>19</b>

\*Must receive a "C-" or above

\*\* Must receive a "C" or above.

#### Teacher Licensure Courses: 57-58 credits

EDUC 204	Social Foundations of Education in the United States: Secondary **	3
EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 219	Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors **	1
EDUC 333	Educational Psychology **	3
EDUC 406	Social Justice Education and Teaching: Secondary **	3
EDUC 426	Principles of Secondary Education **	3
FCEDS 380V	Pre-Student Teaching Experience in FCS Education: Practicum in FCS Labs	2
FCEDS 413	Planning and Assessment for Family and Consumer Sciences **	3

FCEDS 417A	Supervised Teaching in Family and Consumer Sciences: Vocational family and consumer sciences. **	8
FCEDS 417B	Supervised Teaching in Family and Consumer Sciences: Family and consumer sciences. **	8
FCEDS 418	Foundations of Career and Technical Education in Family and Consumer Sciences	3
FCEDS 480V	Pre-Student Teaching Experience in FCS Education: Practicum in Diverse Settings	2
FS HN 111	Fundamentals of Food Preparation *	2
FS HN 115	Food Preparation Laboratory *	1
FCEDS 301K	Textile Selection and Apparel Construction Methods	3-4
or A M D 121	Apparel Assembly Processes	
or A M D 131	Fashion Products and Markets	
One of the following:		3
ARTID 250	Fundamentals of Interior Design *	
ARTID 251	Human Factors in Interior Design *	
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3
One of the following:		3
HD FS 226	Development and Guidance in Middle Childhood *	
HD FS 227	Adolescence and Emerging Adulthood *	
<b>Total Credits</b>		<b>57-58</b>

\*Must receive a "C-" or above

\*\* Must receive a "C" or above.

#### Communications and Library: 10 credits

ENGL 150	Critical Thinking and Communication **	3
ENGL 250	Written, Oral, Visual, and Electronic Composition **	3
One of the following		3
COMST 211	Interpersonal Communication	
COMST 214	Professional Communication	
COMST 218	Conflict Management	
SP CM 212	Fundamentals of Public Speaking	
SP CM 312	Business and Professional Speaking	
LIB 160	Introduction to College Level Research	1
<b>Total Credits</b>		<b>10</b>

\*\* Must receive a "C" or above.

#### Natural Sciences and Mathematical Disciplines: 9-10 credits

BIOL 101	Introductory Biology	3
or BIOL 155	Human Biology	

MATH or STAT course from approved general education options		3-4
CHEM 160	Chemistry in Modern Society	3
<b>Total Credits</b>		<b>9-10</b>

**Social Sciences: 9 credits**

ECON 101	Principles of Microeconomics	3
HD FS 102	Human Development	3
One of the following		3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	
AESHM 421	Developing Global Leadership: Maximizing Human Potential	
FS HN 342	World Food Issues: Past and Present	
PSYCH 101	Introduction to Psychology	
SOC 134	Introduction to Sociology	
<b>Total Credits</b>		<b>9</b>

**Humanities: 6-8 credits**

Select from approved general education options.

Total Credits: 6

Total Credits: 123

**Option 2: Communications**

Total Credits for FCEDS (Communication Option): 123

**Family and Consumer Sciences Education and Studies Core: 19 credits**

HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
FCEDS 206	Professional Roles in Family and Consumer Sciences	2
FCEDS 306	Educational Principles for Family and Consumer Sciences	4
FS HN 167	Introductory Human Nutrition and Health	3
HD FS 249	Parenting and Family Diversity Issues	3
or HD FS 224	Development in Young Children: Birth through Age 8	
HD FS 276	Human Sexuality	3
HD FS 283	Personal and Family Finance	3
or HD FS 239	Consumer Issues	
<b>Total Credits</b>		<b>19</b>

**Communications Options Courses: 51 credits**

AESHM 287	Principles of Management in Human Sciences	3
ENGL 302	Business Communication	3
FS HN 101	Food and the Consumer	3
HD FS 183	Personal Finance in Early Adulthood	1
HD FS 367	Abuse and Illness in Families	3

HD FS 369	Research Methods in Human Development and Family Studies	3
HD FS 377	Aging and the Family	3
HD FS 395	Children, Families, and Public Policy	3
HD FS 418B	Professional Practice Reflection/Discussion: Internships	2
HD FS 449	Program Evaluation and Proposal Writing	3
HD FS 486	Administration of Human Services Programs	3
H S 110	Personal and Consumer Health	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
ENGL 314	Technical Communication	3
One of the following:		3
DSN S 232	Digital Design Communications	
JL MC 476	World Communication Systems	
JL MC 477	Diversity in the Media	
FCEDS 491A	Supervised Experiences in a Professional Setting: Communications	6

**Total Credits 51**

**Communications and Library: 10 credits**

ENGL 150	Critical Thinking and Communication **	3
ENGL 250	Written, Oral, Visual, and Electronic Composition **	3
One of the following		3
COMST 211	Interpersonal Communication	
COMST 214	Professional Communication	
COMST 218	Conflict Management	
SP CM 212	Fundamentals of Public Speaking	
SP CM 312	Business and Professional Speaking	
LIB 160	Introduction to College Level Research	1
<b>Total Credits</b>		<b>10</b>

\*\* Must receive a "C" or above.

**Natural Sciences and Mathematical Disciplines: 10 credits**

BIOL 101	Introductory Biology	3
or BIOL 155	Human Biology	
CHEM 160	Chemistry in Modern Society	3
STAT 101	Principles of Statistics	4
or STAT 104	Introduction to Statistics	

**Total Credits 10**

**Social Sciences: 9 credits**

ECON 101	Principles of Microeconomics	3
HD FS 102	Human Development	3

One of the following	3
A M D 165 Dress, Appearance, and Diversity in U.S. Society	
FS HN 342 World Food Issues: Past and Present	
PSYCH 101 Introduction to Psychology	
SOC 134 Introduction to Sociology	

**Total Credits 9**

### Humanities: 6 credits

Select from approved general education options.

Total Credits: 6

Electives: 19

Total Credits: 123

## Option 3: Professional Studies

Total credits for FCEDS (Professional Studies): 123

### Family and Consumer Sciences Education and Studies Core: 19 credits

HD FS 110 Freshman Learning Community Orientation	1
or HD FS 111 New Transfer Student Seminar	
FCEDS 206 Professional Roles in Family and Consumer Sciences	2
FCEDS 306 Educational Principles for Family and Consumer Sciences	4
FS HN 167 Introductory Human Nutrition and Health	3
HD FS 249 Parenting and Family Diversity Issues	3
or HD FS 224 Development in Young Children: Birth through Age 8	
HD FS 276 Human Sexuality	3
HD FS 283 Personal and Family Finance	3
or HD FS 239 Consumer Issues	
<b>Total Credits</b>	<b>19</b>

### Professional Studies Courses: 44 credits

FS HN 101 Food and the Consumer	3
HD FS 367 Abuse and Illness in Families	3
HD FS 369 Research Methods in Human Development and Family Studies	3
HD FS 418B Professional Practice Reflection/Discussion: Internships	2
HD FS 377 Aging and the Family	3
HD FS 395 Children, Families, and Public Policy	3
HD FS 449 Program Evaluation and Proposal Writing	3
HD FS 486 Administration of Human Services Programs	3
One of the following:	3
AESHM 474 Entrepreneurship in Human Sciences	

ENTSP 310 Entrepreneurship and Innovation	
One of the following:	3
HD FS 341 Income Tax Planning for Families	
HD FS 383 Fundamentals of Financial Planning	
HD FS 482 Family Savings and Investments	
One of the following:	3
AESHM 342 Aesthetics of Consumer Experience	
A M D 362 Cultural Perspectives of Global Dress	
PHIL 340 Aesthetics	
Two of the following:	6
ENGL 302 Business Communication	
ENGL 314 Technical Communication	
P R 220 Principles of Public Relations	
P R 305 Publicity Methods	
FCEDS 491B Supervised Experiences in a Professional Setting: Professional Studies	6
<b>Total Credits</b>	<b>44</b>

### Communications and Library: 10 credits

ENGL 150 Critical Thinking and Communication **	3
ENGL 250 Written, Oral, Visual, and Electronic Composition **	3
One of the following	3
COMST 211 Interpersonal Communication	
COMST 214 Professional Communication	
COMST 218 Conflict Management	
SP CM 212 Fundamentals of Public Speaking	
SP CM 312 Business and Professional Speaking	
LIB 160 Introduction to College Level Research	1
<b>Total Credits</b>	<b>10</b>

\*\* Must receive a "C" or above.

### Natural Sciences and Mathematical Disciplines: 9-10 credits

BIOL 101 Introductory Biology	3
or BIOL 155 Human Biology	
MATH or STAT course from approved general education options	3-4
CHEM 160 Chemistry in Modern Society	3
<b>Total Credits</b>	<b>9-10</b>

### Social Sciences: 9 credits

HD FS 102 Human Development	3
ECON 101 Principles of Microeconomics	3
One of the following	3
AESHM 421 Developing Global Leadership: Maximizing Human Potential	

A M D 165	Dress, Appearance, and Diversity in U.S. Society
FS HN 342	World Food Issues: Past and Present
SOC 134	Introduction to Sociology
<hr/>	
<b>Total Credits</b>	<b>9</b>

### Humanities: 6 credits

Select from approved general education options.

Total Credits: 6

College of Human Sciences Electives: 13-15 credits

Choose from AESHM, FCEDS, FS HN, HD FS, HSP M, H S, or AMD (TC) minimum 9 credits at 300 level or above; electives total will vary to equal a total of 123 credits

University Electives: 12 credits

Total Credits: 123

## The courses listed in this section are approved general education course options for this major.

**Natural Sciences and Mathematics:** 9-10 credits. Coursework designed to facilitate students' understanding of the structure and behavior of the natural world and appreciate mathematics as a valuable tool of the sciences and an intrinsically important way of thinking.

### Licensure

Select 3-4 credits from:	
MATH 104	Introduction to Probability
MATH 105	Introduction to Mathematical Ideas
MATH 140	College Algebra
MATH 150	Discrete Mathematics for Business and Social Sciences
MATH 165	Calculus I
MATH 195	Mathematics for Elementary Education I
STAT 101	Principles of Statistics

### Communications

Select 3-4 credits from:	
STAT 101	Principles of Statistics
STAT 104	Introduction to Statistics

### Professional Studies

Select 3-4 credits from:	
MATH 104	Introduction to Probability
MATH 105	Introduction to Mathematical Ideas
MATH 140	College Algebra

MATH 150	Discrete Mathematics for Business and Social Sciences
MATH 165	Calculus I
MATH 195	Mathematics for Elementary Education I
STAT 101	Principles of Statistics

**Humanities:** 6 credits. Coursework designed to assist students to develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.

Note: Courses meeting International Perspectives requirements are marked with an \*. Additional courses may be found in departments listed with a double \*\*.

AESHM 342	Aesthetics of Consumer Experience	3
AF AM 201	Introduction to African American Studies	3
AF AM 334	Africana Religions	3
AF AM 347	Studies in African American Literature	3
AF AM 353	History of African Americans I	3
AF AM 354	History of African Americans II	3
A M D 257	Museum Studies	3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century *	3
AM IN 210	Introduction to American Indian Studies	3
AM IN 240	Introduction to American Indian Literature	3
AM IN 346	American Indian Literature	3
ARCH 221	Histories and Theories of Architecture to 1750 *	3
ARCH 420	Topics in American Architecture	3
Art History (ART H) **		
American Sign Language (ASL)		
Classical Studies (CL ST) **		
DANCE 270	Dance Appreciation	3
DANCE 360	History and Philosophy of Dance	3
ENGL 201	Introduction to Literature	3
ENGL 225	Survey of British Literature to 1800	3
ENGL 226	Survey of British Literature since 1800	3
ENGL 227	Survey of American Literature to 1865	3
ENGL 228	Survey of American Literature since 1865	3
ENGL 240	Introduction to American Indian Literature	3
HD FS 240	Literature for Children	3
History (HIST) **		
HSP M 260	Global Tourism Management *	3
MUSIC 102	Introduction to Music Listening *	3
MUSIC 302	Masterpieces of Music and Art in Western Culture.	3
MUSIC 304	History of American Rock 'n' Roll	3

MUSIC 383	History of Music I *	3
MUSIC 384	History of Music II *	3
Philosophy (PHIL)		
Religious Studies (RELIG) **		
THTRE 106	Introduction to the Performing Arts	3
THTRE 110	Theatre and Society	3
WGS 201	Introduction to Women's and Gender Studies	3
WGS 336	Religion, Sex and Gender	3
WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
WGS 370	Studies in English Translation (including 370F, G, R. S) *	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World *	3
WGS 385	Women in Politics	3
WGS 386	History of Women in America	3
World Languages and Cultures (ARABC, CHIN, FRNCH, GER, GREEK, RUS, SPAN) **		

## Family and Consumer Sciences Education and Studies, B.S.-teacher licensure option

### Freshman

Fall	Credits Spring	Credits
HD FS 110 or 111	1 HD FS 276	3
HD FS 102	3 HD FS 283 or 239	3
ENGL 150	3 FS HN 167	3
EDUC 204	3 MATH or STAT Course from approved FCEDS list	3
RELIG 205 (Humanities course)	3 AESHM 421, A M D 165, FS HN 342, PSYCH 101, or SOC 134	3
FCEDS 206	2 PSYCH 131	1
LIB 160	1 EDUC 219	1
	<b>16</b>	<b>17</b>

### Sophomore

Fall	Credits Spring	Credits
FCEDS 306	4 CHEM 160	3
EDUC 202	3 HD FS 224 or 249	3
BIOL 101 or 155	3 FS HN 111	2
COMST 211, 214, 218, SP CM 212, or SP CM 312	3 FS HN 115	1
ENGL 250	3 Elective	6

Apply to Educator  
Preparation program

	<b>16</b>	<b>15</b>
<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
EDUC 333	3 FCEDS 418	3
Electives	3 FCEDS 413	3
HD FS 226 or 227	3 SP ED 401	3
FCEDS 301K, A M D 121, or A M D 131	3-4 FCEDS 380V	1
Humanities	3 Elective	3
	<b>15-16</b>	<b>13</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Elective	3 FCEDS 417A	8
FCEDS 480V	2 FCEDS 417B	8
EDUC 406	3 PRAXIS II in content & pedagogy to be taken prior to license approval	
EDUC 426	3	
One of the following: ARTID 250, 251, 355; FCEDS 301F	2-3	
ECON 101	3	
	<b>16-17</b>	<b>16</b>

**US Diversity and International Perspectives Requirement:** Students in Family and Consumer Sciences Education fulfill the US Diversity by taking HD FS 276 and the International Perspectives Requirement by taking FS HN 342.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation.

Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

## Family and Consumer Sciences Education and Studies, B.S.-communications option

### Freshman

Fall	Credits Spring	Credits
HD FS 110 or 111	1 CHEM 160	3
RELIG 205 (Humanities course)	3 FS HN 167	3
ENGL 150	3 FS HN 342, SOC 134, PSYCH 101, AESHM 421, or A M D 165	3

HD FS 102	3 Humanities Course from approved general education options	3
PSYCH 131	1 HD FS 283 or 239	3
LIB 160	1	
HD FS 183	1	
FCEDS 206	2	
		<b>15</b>

**Sophomore**

Fall	Credits Spring	Credits
FCEDS 306	4 P R 305	3
AESHM 287	3 HD FS 249 or 224	3
FS HN 101	3 Elective	3
BIOL 101 or 155	3 STAT 101 or 104	3-4
ENGL 250	3 SP CM 212, COMST 211, COMST 214, COMST 218, or SP CM 312	3
		<b>16</b>
		<b>15-16</b>

**Junior**

Fall	Credits Spring	Credits
HD FS 377	3 ENGL 302	3
H S 110	3 Electives	3
HD FS 367	3 P R 220	3
HD FS 276	3 JL MC 476, 477, or DSN S 232	3
HD FS 369	3 ECON 101	3
		<b>15</b>

**Senior**

Fall	Credits Spring	Credits
ENGL 314	3 FCEDS 491A (3-6 credits)	6
HD FS 486	3 Electives ( to equal 123 total credits)	9
HD FS 395	3	
HD FS 449	3	
HD FS 418B	2	
Elective	3	
		<b>17</b>
		<b>15</b>

US Diversity and International Perspectives Requirement: Students in Family and Consumer Sciences Education fulfill the US Diversity by taking HD FS 276 and the International Perspectives Requirement by taking FS HN 342.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation.

Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

## Family and Consumer Sciences Education and Studies, B.S.-professional studies option

**Freshman**

Fall	Credits Spring	Credits
HD FS 110 or 111	1 FS HN 167	3
RELIG 205	3 CHS Elective	3
ENGL 150	3 MATH or STAT Course from approved FCEDS list	3
HD FS 102	3 CHEM 160	3
LIB 160	1 PSYCH 131**	1
FCEDS 206	2 FS HN 342, SOC 134, A M D 165, AESHM 421, or PSYCH 101	3
FS HN 101	3	
		<b>16</b>
		<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
FCEDS 306	4 COMST 211, 214, 218, SP CM 212, or SP CM 312	3
CHS Elective (300 level)	3 HD FS 283 or 239	3
HD FS 276	3 HD FS 249 or 224	3
BIOL 101 or 155	3 Elective	3
ENGL 250	3 HD FS 367	3
		<b>16</b>
		<b>15</b>

**Junior**

Fall	Credits Spring	Credits
AESHM 342, PHIL 340, or A M D 362	3 CHS Elective (300 level or above)	3
HD FS 369	3 ECON 101	3
HD FS 341, 383, or 482	3 HD FS 486	3
HD FS 377	3 ENGL 302, 314, P R 220, or P R 305	3
CHS Elective (300 level or above)	3 Humanities Course	3
		<b>15</b>
		<b>15</b>

**Senior**

Fall	Credits Spring	Credits
HD FS 395	3 FCEDS 491B	6
AESHM 474 or ENTSP 310	3 Electives to equal 123 total credits	8



HD FS 449	3 CHS Elective (300 level or above)	3
HD FS 418B	2	
ENGL 314, 302, P R 220, or P R 305	3	
		<b>14</b>
		<b>17</b>

**US Diversity and International Perspectives Requirement:** Students in Family and Consumer Sciences Education fulfill the US Diversity by taking HD FS 276 and the International Perspectives Requirement by taking FS HN 342.

**Note:** This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

The **Education Services in Family and Consumer Sciences** minor may be earned by completing 15 credits

HD FS 102	Human Development	3
FCEDS 206	Professional Roles in Family and Consumer Sciences	2
FCEDS 306	Educational Principles for Family and Consumer Sciences	4
FCEDS 413	Planning and Assessment for Family and Consumer Sciences	3
One of the following:		3
FCEDS 418	Foundations of Career and Technical Education in Family and Consumer Sciences	
HD FS 341	Income Tax Planning for Families	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 395	Children, Families, and Public Policy	

## Family and Consumer Sciences, MFCS

### Master of Family and Consumer Sciences (M.F.C.S.)

The College of Human Sciences offers a nonthesis, professional master's degree program offered completely online through the Great Plains Interactive Distance Education Alliance (or GPIDEA).

Students select one of the following specializations (all require 36 credits): Dietetics (no longer accepting new applicants), Family Financial Planning, Gerontology, and Youth Development

The Program of Study committee, in consultation with the student, establishes the courses to be taken and the acceptability of transfer credits. The major professor is selected from the discipline in which the concentration of coursework will be taken. Written and oral final integrative examinations are required in lieu of a thesis or creative component.

Admission requirements for the MFCS include a bachelor's degree from a regionally-accredited college or university, minimum 3.00 cumulative grade point average (students below this GPA will still be considered for admission), transcripts from all colleges and universities attended, two letters of recommendation, and a goal statement. Non-English speaking international students are required to have a TOEFL score of at least 550 at time of admission.

## Graduate Certificates

<https://www.hs.iastate.edu/graduate/>

## Graduate Certificates

Four graduate certificates are available:

- Family Financial Planning (18 credits): fulfills educational requirements of the Certified Financial Planner Board of Standards CFP® Certification Examination.
- Gerontology (15 credits)
- Youth Development Specialist (12 credits)
- Youth Program Management and Evaluation (12 credits)

For additional information, students should contact the Great Plains IDEA Campus Coordinator, 2155 Lagomarcino, gpideainfo@iastate.edu, 515-294-5397.

## Family Financial Planning Interinstitutional Graduate Program

Iowa State University offers a Master's degree in Family and Consumer Sciences with specialization in Family Financial Planning. This is an interinstitutional online program offered through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the degree. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions: Montana State University, North Dakota State University, Oklahoma State University; South Dakota State University, and University of Nebraska-Lincoln.

The master's degree consists of 36 credits, 24 required credits and 12 elective credits (<http://www.online.hs.iastate.edu/graduate-degrees/family-financial-planning/>). This program does not require a thesis.

Both the Master's degree and Graduate Certificate programs at Iowa State University are registered with Certified Financial Planner Board of Standards Inc. As a CFP® Board-registered Program, ISU's FFP courses satisfy CFP® Board's education requirement, allowing an individual to sit for the CFP® Certification Examination.

Iowa State University does not certify individuals to use the CFP®, CERTIFIED FINANCIAL PLANNER™ title. CFP® certification is granted only by Certified Financial Planner Board of Standards Inc. to those persons who, in addition to completing an educational requirement such as this CFP® Board-Registered Program, have met its ethics, experience and examination requirements. (CFP® Board of Standards web site: [www.cfp.net](http://www.cfp.net) (<http://www.cfp.net>)).

Certified Financial Planner Board of Standards Inc. owns the certification marks CFP®, CERTIFIED FINANCIAL PLANNER™ and the federally registered CFP®, which it awards to individuals who successfully complete initial and ongoing certification requirements.

## FFP Graduate Certificate

The Graduate Certificate in Family Financial Planning requires six courses/18 credits which contain the competencies required for the Certified Financial Planner (CFP®) Certification Examination.

Required courses for the Family Financial Planning graduate certificate program include:

FFP 540	Estate Planning for Families	3
FFP 545	Retirement Planning, Employee Benefits, and the Family	3
FFP 555	Insurance Planning for Families	3
FFP 565	Personal Income Taxation	3
FFP 583	Investing for the Family's Future	3
FFP 595	Financial Planning - Case Studies	3

Both the Family Financial Planning Master's degree and Graduate Certificate programs at Iowa State University are registered with Certified Financial Planner Board of Standards Inc. As a CFP Board-registered Program, ISU FFP courses satisfy CFP Board's education requirement, allowing an individual to sit for the CFP® Certification Examination.

This is an interinstitutional online program offered through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the certificate. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions: Montana State

University, North Dakota State University, Oklahoma State University; South Dakota State University, and University of Nebraska-Lincoln.

**Courses primarily for graduate students, open to qualified undergraduates:**

### FFP 520: Financial Theory and Research I

(3-0) Cr. 3. F.S.SS.

Theories of family functioning, macroeconomic theory related to family resource allocation decisions, the family as an economic unit, and the interaction of the economy and families.

### FFP 525: Financial Theory and Research II

(3-0) Cr. 3. F.S.SS.

Microeconomic theory as it relates to family resource allocation decisions, theories of household behavior, the lifecycle hypothesis, behavioral economics, behavioral finance, theories of behavioral change, and psychological theories of family well-being. Focus on empirical research investigating household financial decision-making.

### FFP 530: Fundamentals of Family Financial Planning

(3-0) Cr. 3. F.S.SS.

Introduction to the financial planning process and establishing client-planner relationships. Applied work in cash flow, credit and debt, income tax, insurance, investment, retirement and estate planning. Review of services provided to families, documentation required, ethics in financial planning, and Certified Financial Planner™ licensee responsibilities.

### FFP 535: Financial Counseling

(3-0) Cr. 3. F.S.SS.

Theory and research regarding the interactive process between the client and the practitioner, including communication techniques, motivation and esteem building, the counseling environment, ethics, and methods of data intake, verification, and analysis. Other topics include legal issues, compensation, uses of technology to identify resources, information management, and current or emerging issues.

### FFP 540: Estate Planning for Families

(3-0) Cr. 3. F.S.SS.

Fundamentals of the estate planning process, including estate settlement, estate and gift taxes, property ownership and transfer, and powers of appointment. Tools and techniques used in implementing an effective estate plan, ethical considerations used in providing estate planning services, and new and emerging issues in the field. Case studies provide experience in developing estate plans suitable for varied family forms.

**FFP 541: Housing and Real Estate in Family Financial Planning**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. SS., offered even-numbered years.

The role of housing and real estate in the family financial planning process, including taxation, mortgages, financial calculations, legal concerns, and ethical issues related to home ownership and real estate investments. Emphasis on emerging issues in the context of housing and real estate.

**FFP 545: Retirement Planning, Employee Benefits, and the Family**

(3-0) Cr. 3. F.S.SS.

Study of micro and macro considerations for retirement planning. Survey of various types of retirement plans, ethical considerations in providing retirement planning services, assessing and forecasting financial needs in retirement, and integration of retirement plans with government benefits.

**FFP 550: Military Personal Financial Readiness**

(3-0) Cr. 3. F.SS.

Overview of the topics relevant to the financial planning process that address the unique needs of military service members and their families.

**FFP 555: Insurance Planning for Families**

(3-0) Cr. 3. F.S.SS.

In-depth study of risk management concepts, tools, and strategies for individuals and families, including life insurance; property and casualty insurance; liability insurance; accident, disability, health, and long-term care insurance; and government-subsidized programs. Current and emerging issues and ethical considerations relative to risk management. Case studies provide experience in selecting insurance products suitable for individuals and family, study of investment options for clients including common stocks, fixed income securities, convertible securities, and related choices. Relationships between investment options and employee/employer benefit plan choices. Current and emerging issues and ethics are included.

**FFP 565: Personal Income Taxation**

(3-0) Cr. 3. F.S.SS.

In-depth information on income tax practices and procedures including tax regulations, tax return preparation, the tax audit processes, the appeals process, preparation for an administrative or judicial forum, and ethical considerations of taxation. New and emerging issues related to taxation. Family/individual case studies provide practice in applying and analyzing tax information and recommending appropriate tax strategies.

**FFP 570: Professional Practices in Financial Planning**

(3-0) Cr. 3. F.S.SS.

Challenges of managing financial planning practices including, but not limited to: business valuation, personnel, marketing, client services, ethics and technological applications. Relying both on a theoretical as well as an applied approach, students analyze case studies that provide relevant, practical exposure to practice management issues, with a strong emphasis on current research findings.

**FFP 583: Investing for the Family's Future**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Evaluation of investment markets for the household. Analysis of how families choose where to put their savings. Emphasis is on using the family's overall financial and economic goals to help inform investment choices.

**FFP 590: Family Financial Planning Seminar**

(3-0) Cr. 3. Repeatable, maximum of 3 times. S.SS.

Through a seminar format comprised of readings, guest lectures, collaborative case studies, peer interaction, and practical application, students will explore the rapidly growing and changing opportunities of sustainable, responsible, and impact investments.

**FFP 591: Practicum**

Cr. 3-6. F.S.SS.

Supervised experience in family financial planning.

**FFP 595: Financial Planning - Case Studies**

(3-0) Cr. 3. F.S.SS.

*Prereq: FFP 530, FFP 540, FFP 545, FFP 555, FFP 565, FFP 583*

Professional issues in financial planning, including ethical considerations, regulation and certification requirements, communication skills, and professional responsibility. Students are expected to utilize skills obtained in other courses and work experiences in the completion of personal finance case studies, the development of a targeted investment policy, and other related financial planning assignments.

## Financial Counseling and Planning

Administered by the Department of Human Development and Family Studies. Leading to the degree bachelor of science.

The **Financial Counseling and Planning** curriculum prepares students for careers in family financial services. Financial Counseling and Planning is a growing career field and appeals to students who want to work with individuals and families to help them meet their financial goals and improve their financial capability to better meet financial challenges. Coursework provides students with the family resource management and interpersonal skills needed to help families remain financially secure. Based on individual specific career goals, students may select courses that lead to fulfilling the education requirements

for the leading designations and certifications in financial counseling and planning. Graduates of the program are prepared for employment in personal banking, financial services, insurance, financial counseling and planning, and human service organizations. Laboratory and practicum opportunities exist in the Iowa State University Financial Counseling Clinic and with industry partners. A field experience encourages students to apply their studies and to experience the profession in real-world settings.

## Student Learning Outcomes

Financial Counseling and Planning graduates are prepared to:

1. Help individuals and families make personal finance decisions using time value of money calculations.
2. Deliver professional, competent, and ethical financial counseling and planning services to clients.
3. Apply principles of client psychology within consumer and financial decision making.
4. Measure individual and family financial health and use these measures to create a comprehensive personal financial plan.
5. Attain the leading designations in financial counseling and planning. Upon graduation students have completed the educational requirements for the CERTIFIED FINANCIAL PLANNER™ and Accredited Financial Counselor® designations.

## Total credits required: 120

### Financial Counseling and Planning core (AFC & CFP exam ready): 39 credits

HD FS 102	Human Development	3
or PSYCH 230	Developmental Psychology	
HD FS 239	Consumer Issues	3
HD FS 270	Family Communications and Relationships	3
HD FS 283	Personal and Family Finance	3
HD FS 317G	Field Experiences: Family Finance Programs	1-6
HD FS 341	Income Tax Planning for Families	3
HD FS 378	Retirement Planning and Employee Benefits	3
HD FS 383	Fundamentals of Financial Planning	3
HD FS 384	Family Insurance Planning	3
or FIN 361	Personal Risk Management and Insurance	
HD FS 482	Family Savings and Investments	3
or FIN 320	Investments	
HD FS 484	Estate Planning for Families	3
HD FS 485	Capstone: Family Financial Planning	3
HD FS 489	Financial Counseling	2
HD FS 489L	Financial Counseling Laboratory	1
<b>Total Credits</b>		<b>37-42</b>

## Communications and Library: 13 credits

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
SP CM 212	Fundamentals of Public Speaking	
COMST 211	Interpersonal Communication	
COMST 218	Conflict Management	
One of the following:		3
AGEDS 327	Survey of Agriculture and Life Sciences Communication	
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>13</b>

## Natural Sciences and Mathematical Disciplines: 10 credits

ACCT 284	Financial Accounting	3
COM S 113	Introduction to Spreadsheets and Databases	3
or Computer Science course		3
STAT 101	Principles of Statistics	4
<b>Total Credits</b>		<b>13</b>

## Social Sciences: 9 credits

ECON 101	Principles of Microeconomics	3
SOC 134	Introduction to Sociology	3
or PSYCH 280	Social Psychology	
Social Science course from approved general education options		3
<b>Total Credits</b>		<b>9</b>

## Humanities: 6 credits

Humanities course from approved general education options		6
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## HD FS orientation: 1 credit

HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
<b>Total Credits</b>		<b>1</b>

## Electives: 42 credits as needed to equal 120 total credits

Recommended HD FS Electives (part of total electives).

HD FS 234	Adult Development	3
HD FS 249	Parenting and Family Diversity Issues	3
HD FS 360	Housing and Services for Families and Children	3

HD FS 369	Research Methods in Human Development and Family Studies	3
HD FS 377	Aging and the Family	3
HD FS 395	Children, Families, and Public Policy	3
HD FS 449	Program Evaluation and Proposal Writing	3
HD FS 479	Family Dynamics Through a Social and Cultural Lens	3
HD FS 491	Internship	4

Other recommended electives include courses from accounting, community and regional planning, economics, finance, gerontology, human development and family studies, journalism, management, marketing, political science, psychology, and sociology.

### Total credits: 120 credits

U.S. Diversity and International Perspectives Requirement: Students fulfill the U.S. Diversity and International Perspectives Requirement by choosing three credits of coursework from each of the university-approved lists.

## The courses listed in this section are approved general education course options for this major.

**Natural Sciences and Mathematics:** 9 credits total (3 credits from list below). Coursework designed to facilitate students' understanding of the structure and behavior of the natural world and appreciate mathematics as a valuable tool of the sciences and an intrinsically important way of thinking.

Computer Science (COM S)

Accounting (ACCT)

Mathematics (MATH)

Statistics (STAT)

**Social Sciences:** 9 credits. Coursework designed to help students develop an understanding of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions.

ACCT 215	Legal Environment of Business	3
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AF AM 330	Ethnic and Race Relations	3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	3
A M D 362	Cultural Perspectives of Global Dress	3
A M D 467	Consumer Studies in Apparel and Fashion Products	3
AM IN 310	Contemporary Topics in American Indian Studies	3

AM IN 315	Archaeology of North America	3
AM IN 322	Peoples and Cultures of Native North America	3
Anthropology (ANTHR) - except 202		
Economics (ECON)		
FS HN 342	World Food Issues: Past and Present	3
INTST 235	Introduction to International Studies	3
LING 219	Introduction to Linguistics	3
LING 471	Language and Reading Development in Children	3

Political Science (POL S)

Psychology (PSYCH) - except 131

Sociology (SOC), including Criminal Justice (CJ ST)

WGS 201	Introduction to Women's and Gender Studies	3
WGS 203	Introduction to Lesbian Communities	3
WGS 301	International Perspectives on Women and Gender	3
WGS 320	Ecofeminism	3
WGS 327	Gender and Sexualities in Society	3
WGS 328	Sociology of Masculinities and Manhood	3
WGS 346	Psychology of Women	3
WGS 350	Women of Color in the U.S	3
WGS 385	Women in Politics	3

**Humanities:** 6 credits. Coursework designed to assist students to develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.

AESHM 342	Aesthetics of Consumer Experience	3
AF AM 201	Introduction to African American Studies	3
AF AM 334	Africana Religions	3
AF AM 347	Studies in African American Literature	3
AF AM 353	History of African Americans I	3
AF AM 354	History of African Americans II	3
A M D 257	Museum Studies	3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	3
A M D 356	Euro-American Dress History: Mid-19th Century to the Present	3
AM IN 210	Introduction to American Indian Studies	3
AM IN 240	Introduction to American Indian Literature	3
AM IN 346	American Indian Literature	3
ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 420	Topics in American Architecture	3
Art History (ART H)		
American Sign Language (ASL)		
Classical Studies (CL ST)		

DANCE 270	Dance Appreciation	3
DANCE 360	History and Philosophy of Dance	3
DSN S 183	Design in Context	3
ENGL 201	Introduction to Literature	3
ENGL 225	Survey of British Literature to 1800	3
ENGL 226	Survey of British Literature since 1800	3
ENGL 227	Survey of American Literature to 1865	3
ENGL 228	Survey of American Literature since 1865	3
ENGL 237	Survey of Film History	3
ENGL 240	Introduction to American Indian Literature	3
History (HIST)		
HSP M 260	Global Tourism Management	3
MUSIC 102	Introduction to Music Listening	3
MUSIC 302	Masterpieces of Music and Art in Western Culture.	3
MUSIC 304	History of American Rock 'n' Roll	3
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3
Philosophy (PHIL)		
Religious Studies (RELIG)		
THTRE 106	Introduction to the Performing Arts	3
THTRE 110	Theatre and Society	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
WGS 201	Introduction to Women's and Gender Studies	3
WGS 336	Religion, Sex and Gender	3
WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
WGS 370	Studies in English Translation	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3

World Languages and Cultures (ARABC, CHIN, FRNCH, GER, GREEK, RUS, SPAN)

## Financial Counseling and Planning

### Freshman

Fall	Credits Spring	Credits
COM S 113	3 ENGL 250	3
ENGL 150	3 HD FS 102 or PSYCH 230	3
HD FS 110 or 111	1 HD FS 283	3
HD FS 239	3 STAT 101	4
ECON 101	3 ACCT 215, ECON 102, or INTST 235 (Or Social Sciences Course)	3

LIB 160	1	
	<b>14</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ACCT 284	3 HD FS 383	3
HD FS 270	3 PHIL 230, 235, or RELIG 205 (Or Humanities Courses)	3
PSYCH 280 or SOC 134	3 Electives*	9
SP CM 212, COMST 211, or COMST 218	3	
PHIL 230, 235, or RELIG 205 (Or Humanities Course)	3	
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
ENGL 302, 309, 314, or AGEDS 327	3 HD FS 378	3
HD FS 341	3 HD FS 384 or FIN 361	3
Electives*	9 Electives*	9
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
HD FS 482 or FIN 320	3 HD FS 317G	1-6
HD FS 489	2 HD FS 484	3
HD FS 489L	1 HD FS 485	3
Electives*	9 Electives*	6
	<b>15</b>	<b>13-18</b>

\* Electives: Courses from accounting, community and regional planning, economics, family and consumer sciences education, finance, gerontology, human development and family studies, journalism, management, marketing, political science, psychology, and sociology are suggested.

\*\* See Approved General Education options.

Students in Financial Counseling and Planning fulfill the US Diversity and International Perspectives Requirement by choosing three credits of coursework from each of the university-approved lists.

This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation.

Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

The **Financial Counseling and Planning** minor may be earned by completing 15 credits



HD FS 283	Personal and Family Finance	3
Twelve credits from the following:		12
HD FS 239	Consumer Issues	
HD FS 341	Income Tax Planning for Families	
HD FS 378	Retirement Planning and Employee Benefits	
HD FS 383	Fundamentals of Financial Planning	
HD FS 384	Family Insurance Planning	
HD FS 482	Family Savings and Investments	
HD FS 484	Estate Planning for Families	
HD FS 485	Capstone: Family Financial Planning	
HD FS 489	Financial Counseling	
HD FS 489L	Financial Counseling Laboratory	
<b>Total Credits</b>		<b>15</b>

## Graduate Programs

A Master's degree in Family and Consumer Sciences (MFCS) with a specialization in Family Financial Planning as well as a Family Financial Planning certificate are available. More information can be found at: <https://online.hs.iastate.edu/graduate-degrees/family-financial-planning/>.

## Food Science (H SCI)

Food science is a degree program focused on food issues from the time crops leave the field until consumers buy the food products. Food scientists apply basic science (chemistry, biology, physics) to improve processing, preservation, and safety of food and to develop new food products. The food science major is approved by the Institute of Food Technologists.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Food Science major.

The department also offers a food science minor.

### **Administered by the Department of Food Science and Human Nutrition**

Courses listed below are required.

#### **Total Degree Requirement: 120 cr.**

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

#### **International Perspectives: 3 cr.**

#### **U.S. Diversity: 3 cr.**

#### **Communications and Library: 10 cr.**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3

**Total Credits 10**

#### **Humanities and Social Sciences: 6-12 cr.**

Select Humanities course from approved list		3
ECON 101	Principles of Microeconomics	3
If H Sci student, select:		6
Additional Humanities course		
Additional Humanities or Social Science course		

#### **Ethics: 3 cr.**

FS HN 342	World Food Issues: Past and Present	3
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#### **Mathematical Sciences: 7-8 cr.**

Select 4 credits from:

MATH 160	Survey of Calculus	4
or MATH 165	Calculus I	

Select at least 3 credits from:

STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	

**Total Credits 7-8**

#### **Physical Sciences: 17-19 cr.**

CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	5
CHEM 178	General Chemistry II	3
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	4-6
or CHEM 331 & CHEM 332	Organic Chemistry I and Organic Chemistry II	
PHYS 115 & 115L	Physics for the Life Sciences and Laboratory in Physics for the Life Sciences	5

or PHYS 131 & 131L	General Physics I and General Physics I Laboratory	
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**Total Credits** **17-19**

**Biological Sciences: 10-11 cr.**

BBMB 301	Survey of Biochemistry	3
or BBMB 303	General Biochemistry	
or BBMB 316	Principles of Biochemistry	
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
MICRO 201	Introduction to Microbiology	2-3
or MICRO 302	Biology of Microorganisms	
MICRO 201L	Introductory Microbiology Laboratory	1
or MICRO 302L	Microbiology Laboratory	

**Total Credits** **10-11**

**Food Science and Human Nutrition: 49 cr.**

FS HN 101	Food and the Consumer	3
FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	1
FS HN 207	Processing of Foods: Basic Principles and Applications	3
FS HN 305	Food Quality Management and Control	2
FS HN 311	Food Chemistry	3
FS HN 311L	Food Chemistry Laboratory	1
FS HN 314	Professional Development for Culinary Food Science and Food Science Majors	1
FS HN 315	Professional Skills for Culinary Food Science and Food Science Majors	1
FS HN 351	Introduction to Food Engineering Concepts	3
FS HN 403	Food Laws and Regulations	2
FS HN 406	Sensory Evaluation of Food	3
FS HN 407	Microbiological Safety of Foods of Animal Origins	3
FS HN 410	Food Analysis	3
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 412	Food Product Development	3
FS HN 420	Food Microbiology	3
FS HN 421	Food Microbiology Laboratory	3
FS HN 471	Food Processing	3
FS HN 472	Food Processing Laboratory	2

**Total Credits** **49**

Select 5-6 credits from the following Professional Electives: **5-6**

A B E 325	Biorenewable Systems
ACCT 215	Legal Environment of Business
ACCT 284	Financial Accounting
ACCT 285	Managerial Accounting
AESHM 474	Entrepreneurship in Human Sciences
AGRON 450	Issues in Sustainable Agriculture
AN S 270	Foods of Animal Origin
AN S 270L	Foods of Animal Origin Laboratory
AN S 360	Fresh Meat Science and Applied Muscle Biology
AN S 460	Science and Technology of Value Added Meat Products
CHEM 211	Quantitative and Environmental Analysis
CHEM 211L	Quantitative and Environmental Analysis Laboratory
CHEM 316	Instrumental Methods of Chemical Analysis
CHEM 316L	Instrumental Analysis Laboratory
ECON 235	Introduction to Agricultural Markets
ECON 301	Intermediate Microeconomics
ECON 320	Labor Economics
ECON 335	The Economics of Global Agricultural Food and Bio-energy
ECON 337	Agricultural Marketing
ECON 362	Applied Ethics in Agricultural Business
ECON 460	Agricultural, Food, and Trade Policy
ENTSP 310	Entrepreneurship and Innovation
FS HN 241	Introduction to Manufacturing Processes for Plastics
FS HN 242	The US Food System
FS HN 264	Fundamentals of Nutritional Biochemistry
FS HN 265	Nutrition for Active and Healthy Lifestyles
FS HN 276	Understanding Grape and Wine Science
FS HN 408	Dairy Products Evaluation
FS HN 435	Analysis of Food Markets
FS HN 442	Issues in Food and Society
FS HN 460	Global Nutrition and Health
FS HN 490B	Independent Study: Food Science
FS HN 491B	Supervised Work Experience: Food Science
FS HN 496	Food Science and Human Nutrition Travel Course
FS HN 499	Undergraduate Research
FS HN 509	Sensory Evaluation of Wines
GLOBE 201	Introduction to Global Resource Systems
GLOBE 220	Globalization and Sustainability

GLOBE 303	Agricultural, Food and Natural Global Resource Systems	
HORT 221	Principles of Horticulture Science	
HORT 461	Fruit Crop Production and Management	
HORT 471	Vegetable Production and Management	
HORT 471L	Vegetable Production and Management Lab	
MGMT 371	Organizational Behavior	
MGMT 414	International Management	
MGMT 472	Diversity, Equity, and Inclusion in Organizations	
MIS 301	Management Information Systems	
MKT 340	Principles of Marketing	
MKT 447	Consumer Behavior	
MKT 448	Global Marketing	
Total Credits		5-6

**Electives: 2-13 cr. Select from any university coursework to earn at least 120 total credits. Food science internship experience is strongly recommended during the summers, and students can earn elective credits for the internship experience by enrolling in FS HN 491B.**

Go to FS HN courses.

Food Science, B.S.

#### First Year

Fall	Credits Spring	Credits
FS HN 101	3 FS HN 167	3
FS HN 110	1 CHEM 178	3
CHEM 177	4 BIOL 212	3
CHEM 177L	1 BIOL 212L	1
ENGL 150	3 ECON 101	3
LIB 160	1 Humanities	3
Humanities or Elective	3	
<b>16</b>		<b>16</b>

#### Second Year

Fall	Credits Spring	Credits
CHEM 231 and CHEM 231L or CHEM 331	3-4 BBMB 301, 303, or 316	3
FS HN 203	1 CHEM 332 (if CHEM 331 taken) or Elective	3
ENGL 250	3 MICRO 201 or 302	2-3
PHYS 115 or 131	4 MICRO 201L or 302L	1
PHYS 115L or 131L	1 STAT 101 or 104	3-4
MATH 160 or 165	4 FS HN 207	3
<b>16-17</b>		<b>15-17</b>

#### Third Year

Fall	Credits Spring	Credits
FS HN 311	3 FS HN 305	2
FS HN 311L	1 FS HN 351	3
FS HN 314	1 FS HN 403	2
FS HN 315	1 FS HN 411	2
FS HN 420	3 FS HN 421	3
SP CM 212	3 Professional Elective	3
Professional Elective	3	
<b>15</b>		<b>15</b>

#### Fourth Year

Fall	Credits Spring	Credits
FS HN 406	3 FS HN 342	3
FS HN 410	3 FS HN 412	3
FS HN 471	3 FS HN 472	2
FS HN 407	3 U.S. Diversity (if not already taken) or elective	3
Elective *	2 Humanities/social science (H Sci) or elective (AgLS)	3
<b>14</b>		<b>14</b>

\* Choose elective courses to total equal to or greater than 120 credits.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point considerations.

More information on the Food Science, Food Safety, and Food and Society minors can be found here: <http://catalog.iastate.edu/collegeofhumansciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Food Science and Technology. More information can be found here: <https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=50>.

## Food Science and Human Nutrition

The Department of Food Science and Human Nutrition is jointly administered by the College of Agriculture and Life Sciences and the College of Human Sciences. All curricula offered by the department are available to students in either college. These majors include:

- Culinary food science
- Dietetics
- Diet and exercise
- Food science
- Nutritional science
- Nursing

Visit the department web site at: [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu) (<http://www.fshn.hs.iastate.edu>).

## Undergraduate Study

### Culinary Food Science

Culinary food science is an interdisciplinary degree combining a strong food science foundation with acquisition of culinary skills. The program includes chemistry, organic chemistry, biology, microbiology, and biochemistry as well as quantity food production, fine dining management, and food safety and sanitation. Internship experience in the food industry or culinary business is required. Culinary food science graduates are qualified to work as managers and specialists in food research, product development, culinary applications, and food marketing and sales. For more information: <https://fshn.hs.iastate.edu/find-your-major/culinary-food-science/>

### Dietetics

The Didactic Program in Dietetics (DPD) is accredited by the Accreditation Council for Education in Nutrition and Dietetics, the accrediting agency of the Academy of Nutrition and Dietetics. The dietetics undergraduate curriculum meets the academic requirements as the DPD. Additionally, the curriculum for concurrent Bachelor's and Master's degrees in diet and exercise meets the academic requirements of the DPD. Graduates of the program are eligible to apply for admission to accredited dietetics internships/supervised practice programs. Upon successful completion of the experience program and a master's degree, graduates are eligible to take the national examination administered by the Commission on Dietetic Registration to become a Registered Dietitian Nutritionist (RDN) and to practice in the field of dietetics. There is a \$30 fee for a statement of verification of completion of the DPD. For information about verification statements policies, see the dietetics program website: <https://fshn.hs.iastate.edu/find-your-major/dietetics/>.

The dietetics program includes study in basic sciences, nutrition, and food science with applications to medical dietetics, nutrition counseling and education, and community nutrition. Foodservice management is also an important aspect of the program. Graduates work in clinical settings, consulting, food companies, food services, sports or athletic programs, corporate wellness programs, care facilities for patients from neonatal to geriatric, and community or school health programs.

### Diet and Exercise

A program for concurrent Bachelor of Science and Master of Science (BS/MS) degrees in diet and exercise (<https://fshn.hs.iastate.edu/find-your-major/diet-and-exercise/>) is available. The program is jointly administered by the Department of Food Science and Human Nutrition (FS HN), within the College of Agriculture and Life Sciences and College of Human Sciences, and the Department of Kinesiology within the College of Human Sciences. Students interested in this program enroll as pre-diet and exercise students. In the fall of the third year, students apply for admission to the BS/MS program. Students not accepted into the program can continue toward completion of the BS degree in dietetics or kinesiology and health. Coursework has been designed to facilitate a 4-year graduation date for those students not accepted into the program and electing to complete a single undergraduate degree. Students accepted into the program will progress toward completion of BS/MS degrees in diet and exercise.

### Food Science

Food science is a discipline in which the principles of biological and physical sciences are used to study the nature of foods, the causes of their deterioration, and the principles underlying the processing and preparation of food. It is the application of science and technology to the provision of a safe, wholesome, and nutritious food supply. Biotechnology and toxicology interrelate with food science in the area of food safety. In the food industry, food scientists work in research and development of products or processes, production supervision, quality control, marketing and sales, test kitchens and recipe development, product promotion and communication. Food scientists also work in government regulatory agencies and academic institutions.

The food science major is approved by the Institute of Food Technologists, the national professional organization of food science. Career options include quality control/assurance; production supervision; management and sales; research careers in the food industry, government, or academia; business; journalism; food product formulation and recipe development; food promotion and communication; and consumer services in government and industry. For more information: <https://fshn.hs.iastate.edu/find-your-major/food-science/>

Students in food science have the opportunity to pursue a Master of Business Administration (<http://www.fshn.hs.iastate.edu/undergraduate-programs/food-science/>) (MBA) concurrently with the Bachelor of Science (BS) degree in food science. The program is designed so students can earn both the BS in food science and MBA in five years, to meet the needs of students who are interested in management careers in the food industry. Students apply for admission to the MBA program in the spring of the third year. The program for concurrent BS in food science/MBA degrees is a rigorous 5-year program, and admission is very selective.

## Nutritional Science

Nutritional science looks at the connection between diet and health. Students learn how diet can play a crucial role in the cause, treatment, and prevention of many diseases. There are degree program focuses within nutritional science. The pre-health and research coursework prepares students for work in research laboratories, graduate study in nutrition or biological sciences, or entrance into health professional programs, such as medical, dental, physician assistant, and pharmacy schools. Students gain a strong science education along with human nutrition expertise. The health coach and nutrition and wellness coursework prepares students for work positions in program planning and evaluation for community, public health, non-profit, and corporate wellness programs addressing the growing public interest in nutrition, wellness, and preventative health. Students learn about the role of nutrition and healthy eating for disease prevention and wellness. For more information: <https://fshn.hs.iastate.edu/find-your-major/nutritional-science/>

## Nursing

The Bachelor of Science in Nursing (BSN) program at Iowa State University is a RN-to-BSN program, designed for those who are already a Registered Nurse (RN), and desire to further their nursing career and education to the next level. Iowa State's RN-to-BSN program provides interactive learning opportunities where students can apply their real-world experiences and education to inspire innovation in their places of care. RN-to-BSN students will be challenged to enhance health promotion and disease prevention, apply nursing science and evidenced-based patient-centered care, focus on the culture of health for nurses, individuals, and communities, and demonstrate the continuum of care, from a nurse's self-care to patient care to community and population health.

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is approved by the:

### Iowa Board of Nursing (IBON)

Riverpoint Business Park  
400 SW 8th St., Suite B  
Des Moines, IA 50309  
(515) 281-3255

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is accredited by the:

### Accreditation Commission for Education in Nursing (ACEN)

3390 Peachtree Road NE, Suite 1400  
Atlanta, GA 30326  
(404) 975-5000

The most recent accreditation decision made by the ACEN Board of Commissioners for the baccalaureate nursing program is initial accreditation.

View the public information disclosed by the ACEN regarding this program at <http://www.acenursing.com/accreditedprograms/programSearch.htm>

For more information and RN-to-BSN learning outcomes: <https://fshn.hs.iastate.edu/find-your-major/nursing/>

## FS HN Departmental Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes.

For more information: <https://fshn.hs.iastate.edu/staff-and-faculty/resources/outcomes-assessment/learning-outcomes/>.

Communication Proficiency is certified by a grade of C or better in 6 credits of coursework in composition (ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition or other communication-intensive courses) and a grade of C or better in 3 credits of coursework in oral communication.

## Minors - Undergraduate

The department offers minors in:

- culinary food science
- food and society
- food safety (interdepartmental minor)
- food science
- nutrition

All minors require at least 15 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

**Prerequisites:** Students must complete prerequisite requirements for courses included in the minor.

Minor in Culinary Food Science

FS HN 101	Food and the Consumer	3
FS HN 115	Food Preparation Laboratory	1-2
or FS HN 215	Advanced Food Preparation Laboratory	
FS HN 214	Scientific Study of Food	3
Select additional credits from the following list for a minimum of 15 credits for the minor:		
FS HN 220	American Food and Culture	3
FS HN 305	Food Quality Management and Control	2
FS HN 311	Food Chemistry	4
& 311L	and Food Chemistry Laboratory	
FS HN 403	Food Laws and Regulations	2
FS HN 411	Food Ingredient Interactions and Formulations	2
FS HN 491D	Supervised Work Experience: Culinary Science	1-4
AN S 270	Foods of Animal Origin	3
& 270L	and Foods of Animal Origin Laboratory	
AN S 460	Science and Technology of Value Added Meat Products	3
HSP M 133	Food Safety Certification	1
HSP M 380	Food Production Management	6
& 380L	and Food Production Management Experience	
HSP M 383	Wine and Spirits in Hospitality Management	2
or FS HN 509	Sensory Evaluation of Wines	
HSP M 487	Fine Dining Management	3

Minor in Food and Society (16-17 credits required)

FS HN 101	Food and the Consumer	3
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 242	The US Food System	3
FS HN 342	World Food Issues: Past and Present	3
FS HN 442	Issues in Food and Society	2
Select 2-3 additional credits from:		2-3
AGRON 450	Issues in Sustainable Agriculture	
FS HN 220	American Food and Culture	
FS HN 364	Nutrition and Prevention of Chronic Disease	
FS HN 365	Obesity and Health	
FS HN 403	Food Laws and Regulations	
FS HN 460	Global Nutrition and Health	
FS HN 463	Community Nutrition and Health	
FS HN 496A	Food Science and Human Nutrition Travel Course: International travel	

SOC 220 Globalization and Sustainability

SOC 345 Population and Society

SOC 348 Global Poverty, Resources and Sustainable Development

SOC 444 Sociology of Food and Agricultural Systems

Interdepartmental Minor in Food Safety

FS HN 101	Food and the Consumer	3
or HSP M 233	Hospitality Sanitation and Safety	
FS HN 403	Food Laws and Regulations	2
FS HN 420	Food Microbiology	3
FS HN 489	Issues in Food Safety	1

Select 3 credits from the Food Microbiology area

FS HN/MICRO Microbiological Safety of Foods of Animal Origins 407

FS HN/MICRO Food Microbiology Laboratory 421

MICRO 310 Medical Microbiology

Select 3 credits from the Food Processing area:

FS HN 207 Processing of Foods: Basic Principles and Applications

FS HN 305 Food Quality Management and Control

AN S 270 Foods of Animal Origin & 270L and Foods of Animal Origin Laboratory

AN S 360 Fresh Meat Science and Applied Muscle Biology

FS HN 471 Food Processing

FS HN 472 Food Processing Laboratory

Minor in Food Science:

FS HN 101	Food and the Consumer	3
FS HN 207	Processing of Foods: Basic Principles and Applications	3

Select 9 additional credits:

Food chemistry:

FS HN 311 Food Chemistry (lab optional: FS HN 311L) 3

FS HN 410 Food Analysis 3

FS HN 411 Food Ingredient Interactions and Formulations 2

Food microbiology:

FS HN 407 Microbiological Safety of Foods of Animal Origins 3

FS HN 419 Foodborne Hazards 3

FS HN 420 Food Microbiology 3

FS HN 421 Food Microbiology Laboratory 3

Food processing/engineering:



FS HN 351	Introduction to Food Engineering Concepts	3
FS HN 471	Food Processing	3
FS HN 472	Food Processing Laboratory	2

General food science:

FS HN 305	Food Quality Management and Control	2
FS HN 403	Food Laws and Regulations	2
FS HN 406	Sensory Evaluation of Food	3

Select additional credits from the following list to meet a minimum of 15 credits for the minor:

FS HN 314	Professional Development for Culinary Food Science and Food Science Majors	1
FS HN 315	Professional Skills for Culinary Food Science and Food Science Majors	1

**Minor in Nutrition:** For students from outside the FSHN department

FS HN 167	Introductory Human Nutrition and Health	3
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3

Select at least 6 credits from:

FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 463	Community Nutrition and Health	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 492	Research Concepts in Human Nutrition	2
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4

**Minor in Nutrition:** For students majoring in culinary food science or food science

FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3

Select at least 9 credits from:

FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 463	Community Nutrition and Health	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3

FS HN 492	Research Concepts in Human Nutrition	2
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4

## Graduate Study

The Food Science and Human Nutrition (FSHN) Department offers coursework for the degrees master of science and doctor of philosophy with majors in food science and technology and in nutritional sciences, and minors in food science and technology and in nutrition. Graduate work in meat science is offered as a co-major in animal science and food science and technology.

Prerequisite to major work is a baccalaureate degree in food science, nutrition, or other physical or biological sciences or engineering that is substantially equivalent to those at Iowa State University.

Students taking major work for the degree doctor of philosophy either in food science and technology or in nutritional sciences may choose minors from other fields including anthropology, biorenewable resources and technology, chemistry, biochemistry, economics, education, journalism, microbiology, psychology, physiology, statistics, toxicology, or other related fields.

The Food Science and Technology (FST) graduate program offers MS and PhD degrees in the general areas of Food Chemistry and Functionality, Food Safety and Microbiology, and Food Processing. The FST core curriculum and interdisciplinary faculty team provides holistic graduate student training. Individuals with an undergraduate or graduate degree from a variety of academic training backgrounds, such as food sciences and the various disciplines of biology, chemistry, and agricultural sciences, may enter the FST program.

The interdepartmental graduate program in nutritional sciences, administered through the Graduate College, under the auspices of the Chairs of FSHN and Animal Science, will provide the structure for coordinating and enhancing interdisciplinary nutrition research and graduate education. Graduate students will be able to select from three specializations: animal nutrition, human nutrition, or molecular/biochemical nutrition. The three main departments are FSHN, Animal Science, and Kinesiology, whereas other departments (such as; Biochemistry, Biophysics, and Molecular Biology; Agronomy; and Statistics) may also be involved. (See Nutritional Sciences interdepartmental graduate major).

The Master of Professional Practice in Dietetics program is an online, course-work only, 12-month long, integrated graduate program that combines didactic coursework and on-site supervised experiential learning to train future Registered Dietitian Nutritionists. In addition to the required didactic coursework, students complete a minimum of 1000 hours of supervised experiential learning to meet the eligibility

requirements to take the national credentialing exam for Registered Dietitian Nutritionists. Prerequisite for the program is graduation from a Didactic Program in Dietetics.

The department also offers an online 12-13 credit Graduate Certificate in Food Safety and Defense, in conjunction with the University of Nebraska, Lincoln, Kansas State University and the University of Missouri through the Great Plains Interactive Distance Education Alliance. Course topics include food microbiology, food defense, food toxicology, HACCP, and additional topics related to food safety. Students may be admitted if qualified for admission to the food science master's degree program.

The department offers work for concurrent B.S. and M.S. degree programs that allow students to obtain both the B.S. and M.S. degrees in 5 years. The programs are available to students majoring in nutritional science or pre-diet and exercise, and students progress toward M.S. degrees in nutritional sciences or diet and exercise, respectively. Students interested in these programs should contact the department for details. Application for admission to the Graduate College should be made during the junior year. Students begin research for the M.S. thesis or creative component during the summer after their junior year and are eligible for research assistantships.

Students graduating with advanced degrees in nutritional sciences and in food science and technology will demonstrate competency in their chosen discipline. Measurable outcomes will include the ability to:

- Apply scientific thinking to the analysis, synthesis and evaluation of knowledge within the discipline of food science, nutritional sciences, or dietetics
- Apply ethical reasoning within the discipline of food science, nutritional sciences or dietetics
- Effectively communicate discipline-specific information in written and oral forms to scientific audiences
- Effectively interact within scientific teams
- Facilitate learning within FSHN courses

## Minors - Graduate

The department offers coursework for graduate minors in:

- food science/technology (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/food-science-and-technology/>)
- nutritional sciences (<https://fshn.hs.iastate.edu/graduate-students/graduate-programs/interdepartmental-graduate-program-in-nutritional-sciences/>)

Food Science and Technology Graduate Minor students must complete the following:

- 9 to 12 credits. Students without a background in food chemistry, food engineering/processing, and/or food microbiology are required

to take FS HN 511 and two 600-level courses in two different competency areas.

- 9 credits of graduate level food science coursework as approved by the POS committee.
- Maximum of 3 credits at the 400 level.

Nutritional Sciences Graduate Minor students must complete the following:

- 9 to 12 credits are required. Students who have not taken FS HN 360 or its equivalent (advanced nutrition with a biochemistry prerequisite) will need to take FS HN 360, in which case the Nutrition Graduate minor will constitute 12 credits.
- 9 credits of graduate level nutrition courses as approved by the POS Committee.
- NUTRS 501

## Certificate - Undergraduate

Health Coach (<https://kin.hs.iastate.edu/current-students/academics/health-coach-certificate/>)

The undergraduate health coach certificate provides a rigorous academic and theoretical background in three components of health (nutrition, exercise and motivational coaching) required to prepare workers for the challenges of being a health coach.

## Certificates - Graduate

Food Safety and Defense (<http://www.fshn.hs.iastate.edu/graduate-program/food-safety-defense/>)

The department offers an online 12-13 credit Graduate Certificate in Food Safety and Defense, in conjunction with the University of Nebraska, Lincoln, Kansas State University and the University of Missouri through the Great Plains Interactive Distance Education Alliance. Students may be admitted if qualified for admission to the food science master's degree program .

### Courses primarily for undergraduates:

#### FS HN 101: Food and the Consumer

(3-0) Cr. 3. F.S.SS.

The food system from point of harvest to the consumption of the food by the consumer. Properties of food constituents. Protection of food against deterioration and microbial contamination. Introduction of foods into the marketplace. Processes for making various foods. Government regulations. Use of food additives. Current and controversial topics. High school biology and chemistry or 3 credits of college level biology and chemistry recommended.

**FS HN 102: Nutrition for Sport Performance**

(1-0) Cr. 1. F.S.

A scientific evaluation of dietary needs, dietary supplementation, and pop-culture claims relative to physical/sport performance. Discussion of safe and effective practices to enhance physical/sport performance.

**FS HN 104: Introduction to Professional Skills in Culinary Science**

(0-6) Cr. 1. S.

*Prereq: Major or minor in CUFS A or CUFS H*

Introduction to culinary science. Students will develop fundamental culinary skills by arranged on-campus work experience (100 hours). Sessions with instructor arranged.

**FS HN 110: Professional and Educational Preparation**

(1-0) Cr. 1. F.S.

Introduction to professional and educational development within the food science and human nutrition disciplines. Focus is on university and career acclimation as well as enhancement of communication skills. Offered on a satisfactory-fail basis only.

**FS HN 111: Fundamentals of Food Preparation**

(2-0) Cr. 2. S.

*Prereq: (FS HN 101 or FS HN 167); concurrent enrollment in FS HN 115*

Principles involved in preparation of food products of standard quality. Influence of composition and techniques on properties of food products.

**FS HN 115: Food Preparation Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 111 or FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety.

**FS HN 120: The Biochemistry of Beer**

(Cross-listed with BBMB). (2-0) Cr. 2. F.

An introduction to the major classes of biomolecules, basic biochemical concepts, enzymology, metabolism and genetic engineering as they apply to the production and flavor of beer. All aspects of the biochemistry of beer will be covered, including the malting of barley, starch conversion, yeast fermentation and the chemical changes that occur during the aging of beer. Intended for non-majors. Natural science majors are limited to elective credit only.

**FS HN 120L: Biochemistry of Beer Laboratory**

(Cross-listed with BBMB). Cr. 1.

*Prereq: Credit or concurrent enrollment in BBMB 120*

An introduction to biochemical methods related to the production of beer. Laboratory exercises related to water chemistry, mash enzymology, hop compound extraction and analysis, and yeast biology will be performed. Closely follows the material being taught in BBMB 120. Natural science majors are limited to elective credit only.

**FS HN 167: Introductory Human Nutrition and Health**

(3-0) Cr. 3. F.S.SS.

Understanding and implementing present day knowledge of nutrition. The role of nutrition in the health and well being of the individual and family. High school biology or 3 credits of biology recommended.

**FS HN 203: Contemporary Issues in Food Science and Human Nutrition**

(1-0) Cr. 1. F.S.

Introduction to presentation of published research and discussion of current issues in food science and human nutrition. Emphasis on sources of credible information, ethics, and communication.

**FS HN 207: Processing of Foods: Basic Principles and Applications**

(2-3) Cr. 3. S.

*Prereq: FS HN 101*

Lecture and lab-based instruction on principles of food processing and packaging. Food product-based discussion and activities will highlight raw food materials; unit operations; food quality and safety; processing plant sanitation; food forming and extrusion; fermentation; properties and selection of packaging materials.

**FS HN 214: Scientific Study of Food**

(3-0) Cr. 3. F.S.

*Prereq: (FS HN 167 or FS HN 265); (CHEM 231 or CHEM 331); concurrent enrollment in FS HN 115 or FS HN 215*

Composition and structure of foods. Principles of preparation of standard quality food products. Behavior and interactions of food constituents.

**FS HN 215: Advanced Food Preparation Laboratory**

(0-6) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety. Development of culinary skills and advanced food preparation.

**FS HN 220: American Food and Culture**

(3-0) Cr. 3. F.S.

American cuisine reflects the history of the U.S. It is the unique blend of diverse groups of people from around the world, including indigenous Native American Indians, Africans, Asians, Europeans, Pacific Islanders, and South Americans. Explore factors that impact the American Cuisine of today including diverse ethnic and cultural group influences, historical events related to food diversity in the U.S., and agriculture and industrial impacts on food production. Practical knowledge and basic food preparation techniques related to the U.S. food system and trends. Class sessions will include lectures, class discussions and Tasting Immersion activities.

**FS HN 241: Introduction to Manufacturing Processes for Plastics**

(Cross-listed with TSM). (1-2) Cr. 2. F.S.

*Prereq: MATH 145*

A study of selected materials and related processes used in plastics manufacturing. Lecture and laboratory activities focus on materials, properties, and processes.

**FS HN 242: The US Food System**

(3-0) Cr. 3. S.

*Prereq: FS HN 101 or FS HN 167*

Exploration of the components of our food system including production, processing, and access. A systems approach is used to evaluate the social, environmental, and nutrition/health implications of the US food system. Controversial topics related to how food is produced, processed, marketed and consumed will be discussed.

**FS HN 264: Fundamentals of Nutritional Biochemistry**

(3-0) Cr. 3. F.

*Prereq: FS HN 167; CHEM 163, CHEM 163L; 3 credits in BIOL*

Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

**FS HN 265: Nutrition for Active and Healthy Lifestyles**

(3-0) Cr. 3. S.SS.

*Prereq: FS HN 167; (FS HN 264 or 3 credits in BBMB)*

Fundamentals of nutrient metabolism and nutrient requirements. Role of macronutrient metabolism in physical performance and disease prevention. Effect of manipulation of macronutrient metabolism on physical performance and disease prevention. Applications of nutrient metabolism principles to dietary recommendations and planning.

**FS HN 276: Understanding Grape and Wine Science**

(Cross-listed with HORT). (2-2) Cr. 3. S.

A scientific introduction to viticulture (grape-growing) and enology (wine-making) and grape and wine chemistry. Topics include grape biology and cultivars, vineyard management, geography of wine, wine production, wine classification, grape and wine chemistry, wine sensory. No wine tasting.

**FS HN 301: Nutrigenomics: From Basic Science to Translational Impact**

(2-0) Cr. 1. F.

Introduction to the concepts of nutrigenomics and nutrigenetics and how it affects consumers of food, as well as the implications for human diseases. The potential impact of personalized nutrition and full genome sequencing on health maintenance, chronic disease prevention, and the ethical implications of this knowledge will be explored.

**FS HN 305: Food Quality Management and Control**

(2-0) Cr. 2. S.

*Prereq: 3 credits in STAT*

Fundamentals of statistical decision-making processes and quality control procedures used in food quality assurance programs.

**FS HN 311: Food Chemistry**

(3-0) Cr. 3. F.SS.

*Prereq: BBMB 300 or higher; (CHEM 231 or CHEM 331); ENGL 250*

The structure, properties, and chemistry of food constituents and animal and plant commodities.

**FS HN 311L: Food Chemistry Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in FSHN 311.*

The laboratory practices of structure, properties, and chemistry of food constituents.

**FS HN 314: Professional Development for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in Culinary Food Science or Food Science; Junior or senior classification.*

Introduction to the roles culinary scientists and food scientists hold within industry. Discussions focused on professional and educational development and emerging issues and trends in the food industry.

**FS HN 315: Professional Skills for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in FS HN*

Focus on the importance of professional skills and application of those skills to potential job situations. Professional skills include communication, team building, leadership vs. management styles, business ethics, and continual learning. Junior classification recommended.

**FS HN 340: Foundations of Dietetic Practice**

(2-0) Cr. 2. F.

*Prereq: Major in Dietetics (A or H) or Pre-Diet and Exercise; Junior classification*

Introduction to the profession of dietetics and responsibilities associated with dietetic professional practice. Emphasis on exploring career options in dietetics and preparation for supervised practice and graduate school. Leadership and professional career development for the dietitian is addressed through self reflection and creation of materials for post-baccalaureate programs. Professional issues related to dietetic practice include Code of Ethics, legal credentialing and standards of professional practice, leadership and future trends in the profession.

**FS HN 342: World Food Issues: Past and Present**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.SS.

*Prereq: Junior classification*

Issues associated with global agricultural and food systems including ethical, social, economic, environmental, and policy contexts.

Investigation of various causes and consequences of overnutrition/undernutrition, global health, poverty, hunger, access, and distribution.

Meets International Perspectives Requirement.

**FS HN 351: Introduction to Food Engineering Concepts**

(3-0) Cr. 3. S.

*Prereq: (FS HN 207; [MATH 160 or MATH 165]; [PHYS 131 or PHYS 231]) or**Permission of Instructor*

Methodology for solving problems in food processing and introduction to food engineering concepts including food properties, material and energy balances, sources of energy, thermodynamics, fluid flow, heat transfer, and mass transfer. Credit for only FS HN 351 or CH E 357 may be applied toward graduation for the Food Science major or Food Science minor

**FS HN 360: Advanced Nutrition and the Regulation of Metabolism in Health and Disease**

(3-0) Cr. 3. F.

*Prereq: ENGL 250; FS HN 265*

Physiological and biochemical basis for nutrient needs; assessment of nutrient deficiency and toxicity; examination of nutrient functions and the regulation of metabolism; nutrient-gene interactions; mechanistic role of nutrients in health and disease. 3 credits or concurrent enrollment in 300-level or above Biochemistry recommended. 3 credits in physiology recommended.

**FS HN 361: Nutrition and Health Assessment**

(1-3) Cr. 2. S.

*Prereq: FS HN 265*

The assessment of nutritional status in healthy individuals. Laboratory experiences in food composition and assessment of dietary intake, body composition, and biochemical indices of nutritional status.

**FS HN 362: Nutrition and Health Throughout the Lifecycle**

(3-0) Cr. 3. S.

*Prereq: FS HN 360; credit or concurrent enrollment in BIOL 256 or BIOL 335*

Molecular, biochemical and physiological basis to understand the nutritional aspects of human development and aging. Nutrient needs and various disease states at each stage of human life cycle.

**FS HN 364: Nutrition and Prevention of Chronic Disease**

(3-0) Cr. 3. F.

*Prereq: (BIOL 256; BIOL 256L) or enrolled in NRS major*

Overview of nutrients, their functions, metabolism, food sources and optimal choices for the promotion of health and wellness. Nutrition strategies for the prevention of chronic disease, including cancer, diabetes and obesity, as they apply to individuals or the wider population will be discussed.

**FS HN 365: Obesity and Health**

(3-0) Cr. 3. S.

Multifactorial aspects of obesity, maintenance of healthy weight, and the relationship of weight status and chronic disease prevention. Traditional and novel nutrition and exercise theories as well as current popular diet and exercise trends will be discussed.

**FS HN 366: Communicating Nutrition Messages**

(3-0) Cr. 3. S.

*Prereq: FS HN 264 or FS HN 265*

Theory and application of adult learning and behavior change as it relates to the role of nutrition in health promotion and disease prevention. Discussion of nutrition education and interventions relative to various models. Focus on communication strategies for providing nutrition messages to diverse community audiences using various forms of media and outreach.

**FS HN 367: Medical Terminology for Health Professionals**

(1-0) Cr. 1. F.S.SS.

An independent course focused on medical terminology, abbreviations, and simple clinical mathematical calculations.

**FS HN 392: Food and Nutrition Services Management**

Cr. 3. S.

*Prereq: HSP M 380; HSP M 380L*

Functions and responsibilities related to the management of foodservice systems and nutrition services, including planning, marketing, human resource management, and cost accounting. Only one of HSP M 392 or FS HN 392 may count toward graduation.

**FS HN 403: Food Laws and Regulations**

(2-0) Cr. 2. S.SS.

*Prereq: 3 credits in FS HN at 200-level or above*

History of food law in the US and the world. Relationship between policy, legislation and regulation. Introduction to primary US regulatory agencies and enforcement principles. Discussion of key laws related to food safety and nutrition. Overview of federal and independent research tools and sources of food law.

**FS HN 406: Sensory Evaluation of Food**

(Dual-listed with FS HN 506). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 507). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 408: Dairy Products Evaluation**

(0-3) Cr. 1. S.

Gain experience in identifying quality defects in dairy products including milk, cottage cheese, cheddar cheese, strawberry yogurt, butter, and vanilla ice cream. Intensive training for the National Collegiate Dairy Products Evaluation competition and for dairy product evaluation in the food industry.

**FS HN 410: Food Analysis**

(2-3) Cr. 3. F.

*Prereq: FS HN 311 or CHEM 211*

An introduction to the theory and application of chemical and instrumental methods for determining the constituents of food. Use of standard procedures for food analysis and food composition data bases.

**FS HN 411: Food Ingredient Interactions and Formulations**

(1-3) Cr. 2. F.S.

*Prereq: (FS HN 214 or FS HN 311); 3 credits in STAT*

Application of food science principles to ingredient substitutions in food products. Laboratory procedures for standard formulations and instrumental evaluation, with emphasis on problem-solving and critical thinking.

**FS HN 412: Food Product Development**

(Dual-listed with FS HN 512). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 419: Foodborne Hazards**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**FS HN 420: Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**FS HN 421: Food Microbiology Laboratory**

(Cross-listed with MICRO). (1-5) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**FS HN 430: U.S. Health Systems and Policy**

(Dual-listed with FS HN 530). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 435: Analysis of Food Markets**

(Cross-listed with ECON). Cr. 3. S.

*Prereq: ECON 235; ECON 301; STAT 226*

Food market analysis from an economics perspective; food markets and consumption; methods of economic analysis; food industry structure and organization; food and agriculture regulations; labeling; consumer concerns; agricultural commodity promotion. Final project required.



**FS HN 442: Issues in Food and Society**

(2-0) Cr. 2. F.

*Prereq: Sophomore classification*

In-depth discussion, synthesis, and analysis of domestic and global food issues from a systems approach. Mutually reinforcing interactions between culture, biology, and environmental influences on human dietary habits, nutrition and health will be emphasized. Historical and current foodways of cultural groups will be presented with specific attention to understanding cultural differences. Students will demonstrate how to locate, interpret, evaluate and use professional literature to inform about current food and society issues.

**FS HN 445: Strategies for Personal Food Waste Reduction**

(1-0) Cr. 1. S.

*Prereq: Junior classification*

In-depth analysis and discussion of economic, environmental, social, and ethical implications of food waste. Overview of personal food waste reduction strategies, food recycling/recovery, and responsible waste disposal methods. Discussion and application of advocacy tactics for the promotion of food waste reduction in local communities.

**FS HN 460: Global Nutrition and Health**

(Dual-listed with FS HN 560). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations.

Meets International Perspectives Requirement.

**FS HN 461: Medical Nutrition and Disease I**

(Dual-listed with NUTRS 561). (4-0) Cr. 4. F.

*Prereq: (BIOL 256 or BIOL 335); FS HN 360; FS HN 361; FS HN 367*

Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and improve health.

**FS HN 463: Community Nutrition and Health**

(3-0) Cr. 3. F.

*Prereq: FS HN 361*

Dual-listed with NUTRS 563. Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups. Discussion of the multidimensional nature of those problems and of community programs addressing them. Grant writing as a means for funding community nutrition program development. Significant emphasis on written and oral communication at the lay and professional level.

**FS HN 464: Medical Nutrition and Disease II**

(4-0) Cr. 4. S.

*Prereq: FS HN 461*

(Dual-listed with NUTRS 564) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and promote health.

**FS HN 466: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 566). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 467: Molecular Basis of Nutrition in Disease Etiology and Health Promotion**

(3-0) Cr. 3. S.

*Prereq: 3 credits of BBMB 200 or above or Permission of Instructor*

Understanding the molecular basis for the role of nutrients, nutrient-derivatives, and bioactive compounds in the development, prevention, and treatment of common diseases including diabetes, cancer, vascular disease, obesity, neurological disease, aberrant mineral metabolism, and autoimmune disease. Translating this understanding into practical approaches for improving the health of individuals and populations. Credit for FS HN 360 suggested.

**FS HN 471: Food Processing**

(3-0) Cr. 3. F.

*Prereq: A B E 451 or CH E 357 or FS HN 351*

Principles and application of food processing using both thermal (ex., blanching, pasteurization, canning, drying, freezing, evaporation, aseptic processing, extrusion) and non-thermal (ex., high pressure, irradiation, pulsed electric field, fermentation) unit operations. Emphasis on microbial inactivation, process heat and mass balance, and numerical problem solving.

**FS HN 472: Food Processing Laboratory**

(1-3) Cr. 2. S.

*Prereq: FS HN 471*

Hands-on and demonstration laboratory activities related to food processing principles and applications using lab and pilot-scale equipment. Laboratory experiences include important food processing operations, e.g., blanching/pasteurization, canning, freezing, drying, corn wet milling, fermentation, baking etc. Emphasis on mass balance, interpreting data, writing reports, and presentations. Occasional field trips.

**FS HN 489: Issues in Food Safety**

(Cross-listed with AN S, HSP M, VDPAM). (1-0) Cr. 1. S.

*Prereq:* Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**FS HN 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490A: Independent Study: Dietetics**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490B: Independent Study: Food Science**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490C: Independent Study: Nutrition**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490D: Independent Study: International Experience**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490E: Independent Study: Entrepreneurship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490H: Independent Study: Honors**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Permission of Instructor

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 491: Supervised Work Experience**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* Permission of Instructor; Permission of Advisor

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491A: Supervised Work Experience: Dietetics**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* Permission of Instructor; Permission of Advisor

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491B: Supervised Work Experience: Food Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* Permission of Instructor; Permission of Advisor

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491C: Supervised Work Experience: Nutrition**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* Permission of Instructor; Permission of Advisor

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491D: Supervised Work Experience: Culinary Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* Permission of Instructor; Permission of Advisor

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 492: Research Concepts in Human Nutrition**

(1-3) Cr. 2. F.

*Prereq:* (FS HN 360; Senior classification) or Permission of Instructor

Students will develop and implement research projects with faculty supervision, based on knowledge gained from nutrition, biology and chemistry courses and write a formal science paper to share the results of their research. Students will gain appreciation for independent research and experience creative and innovative aspects of nutrition research.

**FS HN 493: Food Preparation Workshop**

(1-3) Cr. 1-3.

Selected topics in food preparation including scientific principles, culture and culinary techniques. Variable format may include laboratory, recitation, and lecture. Offered on a satisfactory-fail basis only.

**FS HN 495: Practicum**

(1-3) Cr. 2. F.S.

*Prereq: FS HN 366; FS HN 463; Senior classification; major in Nutritional Science-Nutrition and wellness option*

Students will develop, implement and assess a community-based project that engages groups in learning and practicing concepts related to nutrition and wellness. Assessed service learning component. Offered on a satisfactory-fail basis only.

**FS HN 496: Food Science and Human Nutrition Travel Course**

(Dual-listed with FS HN 596). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

(One credit per week traveled and 1 credit for pre-departure class, if offered.) Limited enrollment. Tour and study of food industry, culinary science, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 496A: Food Science and Human Nutrition Travel Course: International travel**

(Dual-listed with FS HN 596A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

**FS HN 496B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 596B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 498: Cooperative Education**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Permission of Department Chair*

Required for students completing professional work periods in a cooperative education program. Students must register prior to commencing each work period. Offered on a satisfactory-fail basis only.

**FS HN 499: Undergraduate Research**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Research under staff guidance. A maximum of 6 credits of FS HN 499 may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**FS HN 506: Sensory Evaluation of Food**

(Dual-listed with FS HN 406). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 407). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 508: Consumer Perceptions and Nutrition Communication**

(2-0) Cr. 2. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current consumer food and nutrition trends. Critical analysis of consumer perceptions relative to current research base. Use of various media to create effective nutrition messages for consumers. Activities designed to meet accreditation standards.

**FS HN 509: Sensory Evaluation of Wines**

Cr. 2. S.

*Prereq: Must be at least 21 years of age; senior or graduate status.*

Principles of sensory evaluation and their application to wine evaluation. Sensory testing methods such as discrimination tests, ranking, descriptive analysis and scoring of wines will be covered. Students will have the opportunity to evaluate and learn about major types and styles of wines of the world. Lab fee.

**FS HN 511: Integrated Food Science**

(3-0) Cr. 3. F.

*Prereq: 3 credits in each of organic chemistry, physics, mathematics, and microbiology.*

Critical review of the key principles of food science and applications in the chemistry, microbiology, and processing of food. Understanding of the impact of processing on the quality of foods with respect to composition, quality and safety.

**FS HN 512: Food Product Development**

(Dual-listed with FS HN 412). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 516: Advanced Nutrition I**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current literature relative to molecular, cellular, and physiologic aspects of macronutrient and micronutrient metabolism. Integration of current evidence-based information, including peer-reviewed literature, to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, MICRO, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**FS HN 518: Advanced Nutrition II**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Principles of research design/methods and interpreting results/statistics in the current peer-reviewed scientific literature. Critical evaluation of the evidence-base to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 521: Microbiology of Food**

(2-0) Cr. 2. S.SS.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Identification, enumeration, and characterization of bacteria, yeasts, and mold associated with foods and food processing. Effects of physical and chemical agents on micro-organisms will be studied. Microbiological problems in food spoilage, food preservation, food fermentation, and food-borne disease will be discussed.

**FS HN 522: Advanced Food Microbiology and Biotechnology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Food microbiology, a course in biochemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Basic principles in biotechnology and applied food microbiology, including current topics of interest in food biotechnology. Introduction to recombinant DNA techniques and how they are applied to genetically modify microorganisms, the use of nucleic acids as tools of rapid detection of microorganisms in foods, basic enzyme immobilization and down-stream processing techniques, and regulatory aspects of food biotechnology.

**FS HN 523: A Multidisciplinary Overview of Food Safety and Security**

(2-0) Cr. 2. FSS.

*Prereq: A course in biology or chemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Multidisciplinary food safety and security perspectives provided by numerous subject matter experts. Topics include food safety policy, ag bioterrorism, border security, animal ID, food defense and site security, risk analysis, crisis communication, epidemiology, HACCP, and more.

**FS HN 524: Food Microbiology**

(3-0) Cr. 3. F.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Food Microbiology looks at the nature, physiology, and interactions of microorganisms in foods. The course is an introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Additionally, the course looks at food plant sanitation and criteria for establishing microbial standards for food products.

**FS HN 525: Principles of HACCP**

(2-0) Cr. 2. F.

*Prereq: Undergraduate biology and chemistry courses; enrollment in GP-IDEA Food Safety and Defense Certificate or permission of instructor.*

A comprehensive study of the Hazard Analysis and Critical Control Point System and its application in the food industry.

**FS HN 526: Ethnic Foods: Food Safety, Food Protection and Defense**

(2-0) Cr. 2. SS.

*Prereq: Graduate standing; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Understanding of the various factors that impact safety of ethnic and imported ethnic foods; knowledge about the handling, preparation, processing and storage of ethnic and imported foods and food products; science-based characterization of representative ethnic foods.

**FS HN 527: Microbiology of Fermented Foods**

(2-0) Cr. 2. SS.

*Prereq: Food microbiology; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Microbiology of fermented foods covers the physiology, biochemistry, and genetics of microorganisms important in food fermentations. The course looks at how microorganisms are used in fermentations and the effects of processing and manufacturing conditions on production of fermented foods.

**FS HN 528: Food Protection and Defense-Essential Concepts**

(2-0) Cr. 2. S.

*Prereq: Enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

This course will provide students with an understanding of the principles required in a food defense program for a food manufacturing, warehousing or distribution center. The topics covered include: defining threats and aggressors; the Bioterrorism Act; food defense teams; vulnerability assessments; security programs; recall and traceability basics; security inspections; crisis management; emergency preparedness; and workplace violence.

**FS HN 530: U.S. Health Systems and Policy**

(Dual-listed with FS HN 430). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 533: Diet and Integrative Therapies for Prevention and Treatment of Diseases**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Explore the role of specific nutrients, dietary bioactive compounds and integrative therapies on disease prevention and treatment. Activities designed to meet accreditation standards.

**FS HN 537: Leadership and Management in Dietetics**

(3-0) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program*

Application of leadership and management theories and approaches relevant to dietetics practice. Use of self-reflection and self-assessment to assist in recognition and development of leadership behaviors. Activities designed to meet accreditation standards.

**FS HN 538: Advanced Medical Nutrition Therapy**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Nutritional biochemistry and physiology related to selected pathophysiology of disease with emphasis on treatment of complex medical problems and current issues. The nutrition care process will be utilized. Evidenced-based practice will be integrated into each disease state covered to optimize nutritional status and promote health. Activities designed to meet accreditation standards.

**FS HN 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**FS HN 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**FS HN 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.



**FS HN 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**FS HN 542F: Introduction to Molecular Biology Techniques:****Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**FS HN 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**FS HN 544: Pediatric Clinical Nutrition**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examines the physiological, biochemical and nutritional aspects of disease processes relevant to infants and children up to 18 years of age. Discussion of medical nutrition therapy for a variety of medical conditions in this population including inborn errors of metabolism, food hypersensitivity, obesity, and diseases of the major organ systems.

**FS HN 554: Supervised Experience in Food Systems Management**

(0-22) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in food service and management. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 555: Supervised Experience in Community Nutrition**

(0-18) Cr. 3. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in community nutrition. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 556: Supervised Experience in Medical Nutrition Therapy**

(0-22) Cr. 5. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in medical nutrition therapy. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 560: Global Nutrition and Health**

(Dual-listed with FS HN 460). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations. Meets International Perspectives Requirement.

**FS HN 562: Advanced Nutrition Assessment**

(4-0) Cr. 4. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Overview and practical applications of methods for assessing nutritional status, including: theoretical framework of nutritional health and disease, dietary intake, biochemical indices, nutrition focused physical exam and body composition across the lifecycle. Activities designed to meet accreditation standards.

**FS HN 566: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 466). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 575: Processed Foods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 214 or FS HN 311; a course in nutrition*

This course will examine effect of industrial and domestic food processing on the nutrient content of food and risk of developing chronic disease.



**FS HN 580: Orientation to Food Science and Nutrition Research**

(1-0) Cr. 1. F.

Orientation to and discussion of research interests in food science and nutrition. Discussion of policy and ethical issues in the conduct of research. Intended for entering students in FS HN. Offered on a satisfactory-fail basis only.

**FS HN 581: Seminar**

(1-0) Cr. 1. S.

Discussion and practice of oral presentation of scientific data in a professional setting. Discussion of issues related to data presentation. Intended for graduate students in their first or second semester in FS HN.

**FS HN 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with GERON, NEURO, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**FS HN 590: Special Topics**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590A: Special Topics: Nutrition**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590B: Special Topics: Food Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590C: Special Topics: Teaching**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 596A: Food Science and Human Nutrition Travel Course: International travel**

(Dual-listed with FS HN 496A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world.

Pre-travel session arranged. Travel expenses paid by students.

Meets International Perspectives Requirement.

**FS HN 596B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 496B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world.

Pre-travel session arranged. Travel expenses paid by students.

**FS HN 599: Creative Component**

Cr. arr.

Nonthesis option only.

**Courses for graduate students:****FS HN 606: Advanced Food Analysis and Instrumentation**

(2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 410, or FS HN 511 or equivalent.*

Instrumental methods for measuring chemical and physical properties of foods, food quality and functionality. Techniques for methods development, sample preparation, optimization of operating conditions, and data analysis needed to obtain accurate, reproducible results by means of instrumentation.

**FS HN 611: Advanced Food Processing**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: FS HN 311, or FS HN 471/472 or equivalent, or FS HN 511.*

Recent advances in the science and technology of food processing and preservation; examples include both thermal and non-thermal processes, including cold plasma, nanotechnology, and extrusion. Advances in extraction and separation technologies, by-product utilization, and sustainability in food processing industry will also be discussed. Students to research on select topics and present.

**FS HN 612: Advanced Food Chemistry**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 411, or FS HN 511, or BBMB 404, or equivalent.*

Structure, chemical and physical properties of lipids, proteins and carbohydrates, and their food and industrial applications. Changes in functionalities during processing and storage.

**FS HN 626: Advanced Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**FS HN 627: Rapid Methods in Food Microbiology**

(Cross-listed with MICRO, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**FS HN 653: Food and Agricultural Traceability**

(3-0) Cr. 3. F.

*Prereq: Enrollment in The Ivy Executive MBA program within the Ivy College of Business at Iowa State University*

Current issues and concepts of food and agricultural product traceability in the U.S., from production to consumption. Food types, microbial agents of concern, adulterants, disease investigations, risk analysis, risk mitigation, prevention and regulatory policy and advocacy. Travel to Washington, D.C.

**FS HN 681: Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

Presentation of thesis or dissertation research. Must be taken once for each graduate program; once for the M.S. program and once for the Ph.D. program.

**FS HN 682: Seminar Reflection**

Cr. R. Repeatable. F.S.

Active listening and critical thinking activities related to research seminars in food science and human nutrition. Required each semester for all FSHN graduate students. Electronic documentation.

**FS HN 690: Special Problems**

Cr. arr. Repeatable. F.S.SS.

*Prereq: FS HN 502 or FS HN 503 or FS HN 504 or FS HN 553 or FS HN 554*

**FS HN 695: Grant Proposal Writing**

(Cross-listed with NUTRS). (1-0) Cr. 1. F.

*Prereq: 3 credits of graduate course work in food science and/or nutritional sciences*

Grant proposal preparation experiences including writing and critiquing of proposals and budget planning. Understanding the grant funding process from federal, foundation, and commodity agencies. Includes preparing a grant for possible submission and participation in the review of proposals. Discussion of the role of successful grant writing in career development.

**FS HN 699: Research in Food Science and Technology**

Cr. arr. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

## Gerontology

### Interdepartmental Undergraduate and Graduate Minors and Graduate Degree Programs

The gerontology program is designed for students interested in improving their understanding of adult development and aging across contexts and desiring careers in a variety of aging-related fields. Graduates understand the ways in which individual and societal aging influence, and

are impacted by, developments in their major field of study. They have an appreciation and understanding of the interdisciplinary aspects of human aging.

### Undergraduate

Undergraduate students may elect to minor in Gerontology, complementing their major. Courses prepare students to apply aging-related expertise to their field of study.

### Graduate

Students enrolled in the on-campus master's and doctoral programs are able to choose a home department in any unit across campus including, but not limited to Design, Human Development and Family Studies, Kinesiology, Political Science, School of Education, and Sociology. Students take courses and engage in research and outreach to develop the necessary interdisciplinary breadth which, in combination with other disciplinary training, can prepare them for diverse career pathways. Students work with their Major Professor and Program of Study Committee members to chart a course of study. Current Iowa State graduate students can enroll in the Gerontology graduate minor.

Students enrolled in the online graduate certificate and master's programs take courses from experts across partnering institutions to prepare them for translational and applied positions in the field of aging. The program is designed to be flexible and meet student needs.

### Undergraduate Study

Undergraduate study in this program provides the student with an opportunity to develop a minor in gerontology. A balanced grouping of courses assists the student in developing both a sensitivity to the issues and the ability to synthesize ideas from the variety of disciplines important to the study of the aging process.

### Minor

Undergraduate students may minor in gerontology by taking 16 semester hours of gerontology related courses. Nine of these credits must come from the following courses:

GERON 373	Death as a Part of Living	3
GERON 377	Aging and the Family	3
GERON 378	Retirement Planning and Employee Benefits	3

Students will participate in a prepracticum seminar, GERON 466 Gerontology Prepracticum Seminar, and will complete a supervised field practicum after all gerontology coursework is completed (GERON 467 Gerontology Practicum). A minimum of 3 semester credits must be selected from a list of supportive gerontology related courses. Supportive courses include units or topics related to aging and can be used to complement the student's major interests. The minor must include at least 9 credits that are not used to meet any other department, college, or

university requirement. The student's minor program must be approved by the undergraduate gerontology coordinator.

## Graduate Minor

A graduate minor in Gerontology is available to any current ISU graduate student and consists of a minimum of 12 credits taken from a list of acceptable courses, and from at least two departments. Nine of the 12 credits must be in courses that are focused specifically on aging. One 590 course (3 credits maximum) can be taken as part of the 12 credits. At least one member of the Gerontology faculty will be on a student's Program of Study Committee.

## On-Campus Programs

Our on-campus Gerontology master's and doctoral degree programs are interdepartmental in nature. This means students receive content and training in Gerontology as well as a complementary discipline. We believe an interdisciplinary and collaborative approach allows students to enhance their experiences, training, and skills and ultimately their marketability and career success. Students work with their Major Professor and committee members to craft a program of study which encompasses core Gerontology and home department curriculum while fitting the unique needs of the student.

## Online Programs

Iowa State University offers a Master's degree in Family and Consumer Sciences with specialization in Gerontology. This is an interinstitutional online program offered through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the degree. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions North Dakota State University, Oklahoma State University, Texas Tech University, and University of Arkansas.

The master's degree consists of 36 credits, 24 required credits and 12 elective credits (<https://online.hs.iastate.edu/graduate-degrees/gerontology/>). This program does not require a thesis.

## Graduate Certificate

The 15-credit Graduate Certificate in Gerontology (<https://online.hs.iastate.edu/graduate-degrees/gerontology/>) is offered completely online through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the certificate. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions North Dakota State University, Oklahoma State University, Texas Tech University, and University of Arkansas. This is a stand-alone graduate certificate available to any student with a bachelor's degree.

### Courses primarily for undergraduates:

#### GERON 234: Adult Development

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: HD FS 102 or PSYCH 230*

Introductory exploration of the health, individual and social factors associated with adult development including younger adulthood, middle age and older adulthood. Information is presented from a life-span developmental framework.

#### GERON 373: Death as a Part of Living

(Cross-listed with HD FS). (3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: HD FS 102*

Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes.

#### GERON 377: Aging and the Family

(Cross-listed with HD FS). (3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

Interchanges of older adults and their families. Emphasis on role changes, social interaction, and independence as influenced by health, finances, life styles, and community support.

#### GERON 378: Retirement Planning and Employee Benefits

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits.

#### GERON 378H: Retirement Planning and Employee Benefits: Honors

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits. Additional work required to meet Honors requirements.

**GERON 466: Gerontology Prepracticum Seminar**

(1-0) Cr. 1. F.S.SS.

*Prereq: 9 credits in core courses for the gerontology minor and approval of the gerontology undergraduate coordinator*

Prepracticum training for students planning a gerontology practicum. Exploration of possible agencies for the practicum, in-depth study of a selected agency, and development of goals and objectives for the practicum.

**GERON 467: Gerontology Practicum**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: GERON 466, advance reservation*

Supervised field experience related to aging. Offered on a satisfactory-fail basis only.

**GERON 490: Independent Study**

Cr. arr.

*Prereq: Permission of Instructor*

Consult program coordinator for procedure.

**Courses primarily for graduate students, open to qualified undergraduates:**

**GERON 501: Seminar**

Cr. arr. Repeatable. F.S.SS.

**GERON 510: Survey of Gerontology**

Cr. 1-3. Repeatable. S.

Provides an overview of important gerontological issues.

**GERON 521: Biological Principles of Aging**

(Cross-listed with EEOB). (3-0) Cr. 3. SS.

*Prereq: BIOL 211 and BIOL 212*

Basic biological principles of aging. Course modules include an introduction to the aging process, body systems and normal aging, and environment and the biology of aging. In addition, disorders and diseases of aging, prevention and treatment and exercise and aging topics will be covered.

**GERON 522: Long-Term Care**

(3-0) Cr. 3. F.

Administration principles involved in the planning, organizing and directing of long-term care agencies. Includes an in-depth exposure to federal and state standards and regulations governing long-term care.

**GERON 523: Mental Health and Aging**

(3-0) Cr. 3. S.

Introduction to the range of issues involved in aging and mental health. From a systems framework the major emotional and psychiatric problems encountered in old age will be examined including mood, anxiety, adjustment and personality disorders, dementia, cognitive problems, substance abuse, and suicide. Barriers to treatment and cohort and cultural issues will be explored.

**GERON 524: Cognitive Health**

(3-0) Cr. 3. SS.

Cognitive skills form the foundation for functioning in everyday life and these skills take on added importance in older adulthood. This course focuses on selected theoretical approaches and current research related to cognitive aging. We will review normative and non-normative cognitive changes, assessment techniques, and prevention/intervention efforts. Throughout the course we will keep the role of environment and life-span implications in the forefront of our discussion.

**GERON 530: Perspectives in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Overview of current aging issues including theory and research, critical social and political issues in aging, the interdisciplinary focus of gerontology, career opportunities, and aging in the future.

**GERON 531: Foundations in Integrative Aging Studies**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Introduction to foundational concepts in the interdisciplinary field of aging studies, including: core theories of adult development and aging how to be critical consumers of aging research; developing writing and other professional skills; and exploring career options in aging.

**GERON 534: Adult Development**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

Exploration of the biological, psychological and social factors associated with aging. Although the focus is on the later years, information is presented from a life-span developmental framework. Empirical studies are reviewed and their strengths, limitations and implications for normative and optimal functioning are discussed.

**GERON 540: Nutrition and Physical Activity in Aging**

(Cross-listed with DIET). (3-0) Cr. 3. F.

WWW only. Basic physiologic changes during aging and their impacts in health and disease. The focus will be on successful aging with special emphasis on physical activity and nutrition. Practical application to community settings is addressed.

**GERON 545: Economics, Public Policy, and Aging**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Policy development in the context of the economic status of the older adult population. Retirement planning and the retirement decisions; social security and public transfer programs; intra-family transfers to/from the aged; private pensions; financing medical care; prospects and issues for the future.

**GERON 563: Environments for the Aging**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: HD FS 360 or 3 credits in housing, architecture, interior design, rehabilitation, psychology, or human development and family studies or permission of instructor*

Emphasis on independent living within residential settings including specialized shelter, supportive services and housing management. Application of criteria appropriate for accessibility and functional performance of activities; universal design principles. Creative project provides service learning opportunities.

Meets U.S. Diversity Requirement

**GERON 571: Design for All People**

(Cross-listed with ARCH). (3-0) Cr. 3. S.

*Prereq: Graduate or Senior classification*

Principles and procedures of inclusive design in response to the varying ability level of users. Assessment and analysis of existing buildings and sites with respect to standards and details of accessibility for all people, including visually impaired, mentally impaired, and mobility restricted users. Design is neither a prerequisite nor a required part of the course. Enrollment open to students majoring in related disciplines. Credit counts toward fulfillment of History, Theory, Culture requirements.

**GERON 577: Aging in the Family Setting**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theories and research related to personal and family adjustments in later life affecting older persons and their intergenerational relationships. Related issues including demographics also are examined through the use of current literature.

**GERON 584: Program Evaluation and Research Methods in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

Overview of program evaluation, research methods, and grant writing in gerontology. Includes application of quantitative and qualitative methods in professional settings.

**GERON 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with FS HN, NEURO, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**GERON 590: Special Topics**

Cr. arr. Repeatable.

Consult program coordinator for procedure.

**GERON 591: Internship**

Cr. 1-9. Repeatable, maximum of 9 credits. F.S.SS.

Supervised experience in an area of gerontology.

**GERON 594: Professional Seminar in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. SS.

An integrative experience for gerontology students designed to be taken near the end of the degree program. By applying knowledge gained in earlier coursework, students will strengthen skills in ethical decision-making behavior, applying these skills in gerontology-related areas such as advocacy, professionalism, family and workplace issues. Students from a variety of professions will bring their unique perspectives to bear on topics of common interest.

**GERON 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

**Courses for graduate students:****GERON 630: Theories of Aging**

(3-0) Cr. 3. Alt. SS., offered irregularly.

*Prereq: 6 credits in social sciences or permission of instructor*

Historical, contemporary, and interdisciplinary basis of aging theory. Biological, psychological, sociological, and human developmental conceptualizations of aging will be critically assessed. Emphasis will be placed on conceptual models, as well as theoretical development and application within gerontological research and the field of aging.



**GERON 635: Adult Development, Aging, and Health**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* HD FS 510 or permission of instructor

Review of the impact of the growing older adult population as well as individual development and aging on individuals, families, and society. Exploration of theoretical perspectives applied to adult development and aging and distinction of normative and non-normative changes in adulthood. Discussion of methods to assess development across adulthood and consideration of the role of individual and environmental factors impacting efforts to optimize adult development.

**GERON 699: Research**

Cr. arr. Repeatable. F.S.SS.

## Global Human Sciences Minor

Students can earn a Global Human Sciences Minor by completing a minimum of 15 credits (17 for those participating in International Student Teaching), including 6 credits of required core courses and between 9 and 11 credits selected from a designated list of courses offered by the departments and school in the College of Human Sciences. This minor is available to any undergraduate student at Iowa State University.

The Global Human Sciences Minor will contribute to students' ability to:

- Develop and demonstrate effective and professional oral and written communication skills regarding global human sciences
- Reflect on their experience with global human sciences and on how it has influenced their understanding of what it means to be a human scientist
- Analyze how social, cultural, technological, and economic contexts have affected the development of human sciences disciplines at home and abroad
- Identify and explain how issues of ethics, diversity, and social responsibility influence global human sciences

## Required Core Courses (6 credits)

H SCI 301	Introduction to Global Human Sciences	1
H SCI 302	Global Human Sciences Capstone	2
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3

## Additional Courses (9-11 credits)

**All students except International Student Teaching participants:** Select 9 credits from the list below.

**CHS students only:** Select at least 3 credits from the list below that are outside the home department or school.

**International Student Teaching participants only:** select 8 credits from EDUC 416D, EDUC 416E, or EDUC 417N, and 3 credits from the list below outside the School of Education for a total of 11 credits.

A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	3
A M D 355X	Textile History: Global Perspectives of Textiles	3
A M D 362	Cultural Perspectives of Global Dress	3
A M D 372	Sourcing and Global Issues	3
AESHM 281	Orientation to International Field Study	1
AESHM 381D	International Field Study: Hospitality Management	1-3
AESHM 381F	International Field Study: Event Management	1-3
AESHM 381N	International Field Study: Apparel, Merchandising, and Design	1-3
A TR 549A	Athletic Training Clinical Education Study Abroad: Preparing for the Experience	1
A TR 549B	Athletic Training Clinical Education Study Abroad	2
DANCE 211	Fundamentals and Methods of Social and World Dance	1
DANCE 270	Dance Appreciation	3
DANCE 385	Methods of Teaching Dance	2
EDUC 275	International Travel Study - Pre-departure Orientation	1
EDUC 416D	Supervised Student Teaching - Elementary: International Student Teaching - Primary Grades	8
EDUC 416E	Supervised Student Teaching - Elementary: International Student Teaching - Intermediate Grades	8
EDUC 417N	Student Teaching: International	8
EDUC 475	International Travel Study in Education	1-6
EVENT 423	International Meetings and Conferences Management	3
FS HN 342	World Food Issues: Past and Present	3
FS HN 442	Issues in Food and Society	2
FS HN 460	Global Nutrition and Health	3
FS HN 490D	Independent Study: International Experience	1-6
FS HN 496A	Food Science and Human Nutrition Travel Course: International travel	1-4
HD FS 479	Family Dynamics Through a Social and Cultural Lens	3
HD FS 481X	International Studies in HD FS: Group Study	1-3
HD FS 575	Cross-cultural Perspectives about Families and Children	3
HSP M 260	Global Tourism Management	3
HSP M 487	Fine Dining Management	3



KIN 381A	Study Abroad Experience in Kinesiology: Preparing for the Experience	1
KIN 381B	Study Abroad Experience In Kinesiology	2
NRS 490C	Independent Study: International Experience	1-2
Internship or work experience course		1-6
Courses completed at an international institution as part of a study abroad experience from the following options *		1-6
Accademia Italiana		
Australia: Semester at University of Deakin		
Australia: Semester at University of Newcastle		
Fu Jen Catholic University Exchange		
Glasgow Caledonian University Exchange		
London College of Fashion		
Lorenzo de' Medici Institute		
New Zealand: Semester at University of Otago		
Paris American Academy		

\* Coursework must be in a human sciences discipline.

Students may request a review of coursework to be completed as part of a study abroad experience at other international institutions that would meet this requirement.

## Health Coach Certificate

### Health Coach - Certificate

The undergraduate health coach certificate provides a rigorous academic and theoretical background in three components of health (nutrition, exercise and motivational coaching) required to prepare workers for the challenges of being a health coach. The certificate provides additional credentials for students already pursuing a bachelor's degree in food science and human nutrition, kinesiology, or psychology. Students would be able to sit for the American Council on Exercise exam should they choose to do so.

Any Iowa State University student may apply for the undergraduate health coach certificate. Students should contact their academic advisor to add the Health Coaching Certificate.

The Health Coach certificate requires 23 credits:

Note: Pre-requisites apply for all courses required in the health coach certificate.

FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 364	Nutrition and Prevention of Chronic Disease	3
or FS HN 365	Obesity and Health	
FS HN 361	Nutrition and Health Assessment	2

KIN 458	Principles of Fitness Assessment and Exercise Prescription	4
KIN 467	Exercise and Health: Behavior Change	3
PSYCH 422	Counseling Theories and Techniques	3
PSYCH 485	Health Psychology	3
FS HN 495	Practicum	2
or KIN 494A & KIN 494B	Practicum in Motivational Interviewing for Health: Principles of Motivational Interviewing and Practicum in Motivational Interviewing for Health: Supervised Experience	

**Total Credits**

**23**

## Hospitality Management

### Administered by the Department of Apparel, Events, and Hospitality Management

The Hospitality Management program offers study for the degree of Bachelor of Science with a major in hospitality management. As the only 4-year hospitality program in the state of Iowa, the program prepares undergraduate students with essential principles of managing a variety of hospitality organizations, such as hotels, restaurants, clubs, and foodservice companies. Students also develop expertise in managing diverse areas, such as: (a) food/beverage management, (b) lodging management, (c) senior living management, and (d) tourism and attractions.

Students get hands-on experience at the Joan Bice Underwood Tearoom and SPARKS. The Joan Bice Underwood Tearoom is a 105-seat learning laboratory where students take responsibility for meal preparation and service. The Joan Bice Underwood Tearoom is the earliest established student run restaurant that is still in operation on a college campus in the United States. SPARKS is the student operated café in the Student Innovation Center, where students have the opportunity to manage all the operations of the facility from menu development, inventory, human resources, and much more.

Our students participate in internships locally, nationally, and internationally with a range of hotels, restaurants, caterers, theme parks, sports facilities, cruise ships convention and visitor's bureaus, independent businesses, and country clubs. Courses provide students with opportunities to develop and apply management techniques in hospitality organizations. The Hospitality Management curriculum provides students with the opportunity to obtain professional certifications in multiple areas.

The Hospitality Management program mission is to create, share, and apply knowledge to provide hospitality consumers with products, services, and experiences to enhance overall well-being. We accomplish our mission with a personalized, nationally ranked program. Our students

learn in a nurturing, safe, and inclusive environment, with caring faculty with industry experience.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Identify and apply the knowledge and skills necessary for hospitality and tourism operations
2. Develop and integrate a core set of business skills necessary to successfully operate a hospitality and tourism organization
3. Demonstrate competence in the communication skills necessary for hospitality and tourism management
4. Formulate business decisions in hospitality and tourism management
5. Evaluate leadership principles necessary in the diverse and global hospitality and tourism industry

## UNDERGRADUATE STUDY

The program offers a Bachelor of Science degree in hospitality management. Coursework is planned to provide students with a general education plus professional preparation for supervisory and executive positions in hospitality organizations such as clubs, hotels, dining, theme parks, cruise lines, and casinos. Principles of business management are presented, as well as fundamentals of hospitality operations.

Graduates demonstrate leadership characteristics and make decisions based on integrating knowledge of financial, human resources, marketing, and operational principles for managing hospitality operations. They demonstrate best practices in meeting customer expectations and use of technology (e.g., Point-of-Sales systems, property management systems, and revenue management systems) to achieve operational efficiency and effectiveness.

Learning experiences are provided in the food and beverage, casino, lodging, senior living, and tourism industries and other approved establishments. Students are required to have a total of at least 800 hours of relevant work experience prior to graduation. Of the 800 hours, 200 hours are required prior to completing one year in the program.

## The Bachelor of Science Degree

Total credits required: 123, including a minimum of 18 credits from the AESHM Department at Iowa State University for the degree.

The program offers a **concurrent B.S. and M.S. degree** that allows students to obtain a B.S. and M.S. degree in hospitality management in *five* years. Application for admission to the Graduate College should be made in the junior year.

## Minor in Hospitality Management

The Hospitality Management minor (HSP M) requires the completion of at least 15 credits from the Hospitality Management curriculum. The minor must include at least 6 credits in courses numbered 300 or above taken at ISU. All course pre-requisites must be completed prior to taking the course. All minor courses must be taken for a grade.

## Minor in Beverage Management

The Beverage Management minor (BV M) requires the completion of at least 15 credits from the Beverage Management minor curriculum. The minor must include at least 6 credits in HSP M courses and 6 credits in courses numbered 300 or above taken at ISU. All course pre-requisites must be completed prior to taking the course. All minor courses must be taken for a grade.

## Curriculum in Hospitality Management

Administered by the Apparel, Events, and Hospitality Management Department. Leading to the Bachelor of Science degree.

The curriculum in Hospitality Management develops students as leaders for the hospitality professions.

A minor in Hospitality Management is available; see requirements under Hospitality Management, Courses and Programs.

Students majoring in Hospitality Management are required to earn C- or better in all AESHM and HSP M courses. Communication Proficiency Requirement: Grade of C or better in ENGL 150 Critical Thinking and Communication, and ENGL 250 Written, Oral, Visual, and Electronic Composition.

## Degree Requirements

### 10 Communications and Library

ENGL 150	Critical Thinking and Communication (Grade of C or better required in ENGL 150)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (Grade of C or better required in ENGL 250)	3
LIB 160	Introduction to College Level Research	1
Select one (1) course:		3
COMST 211	Interpersonal Communication	
COMST 214	Professional Communication	
SP CM 212	Fundamentals of Public Speaking	

**Total Credits** **10**

### 9-10 Natural Sciences and Mathematical Disciplines

Select one (1) course: (AESHM 175D required if C+ or lower in MATH credits)

MATH 104	Introduction to Probability
MATH 105	Introduction to Mathematical Ideas

MATH 140	College Algebra	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 160	Survey of Calculus	
FS HN 167	Introductory Human Nutrition and Health	3
Select one (1) course:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>9-10</b>

### 9 Social Sciences

ECON 101	Principles of Microeconomics	3
Select two (2) courses:		6
HD FS 102	Human Development (Senior living management required to take this course)	
PSYCH 101	Introduction to Psychology	
SOC 134	Introduction to Sociology	
<b>Total Credits</b>		<b>9</b>

### 6 Humanities

AESHM 342	Aesthetics of Consumer Experience	3
Select one (1) course:		3
AF AM 201	Introduction to African American Studies	
AF AM 310	Africa to 1880	
AF AM 311	Africa under Colonial Rule	
AF AM 330	Ethnic and Race Relations	
AF AM 334	Africana Religions	
AF AM 335	Race, Ethnicity, and the US Criminal Justice System	
AF AM 347	Studies in African American Literature	
AF AM 350	Women of Color in the U.S	
AF AM 353	History of African Americans I	
AF AM 354	History of African Americans II	
AF AM 460	Seminar in African American Culture	
AF AM 473	Civil Rights and Ethnic Power	
A M D 257	Museum Studies	
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	
AM IN 210	Introduction to American Indian Studies	
AM IN 346	American Indian Literature	
ANTHR 201	Introduction to Cultural Anthropology	
ANTHR 202	Human Origins	
ANTHR 210	Introduction to Asian American Studies	
ANTHR 220	Globalization and Sustainability	

ANTHR 225	American Indians of Iowa
ANTHR 230	Globalization and the Human Condition
ANTHR 306	Culture and Interpretation
ANTHR 307	Biological Anthropology
ANTHR 308	Archaeology
ANTHR 309	Introduction to Culture and Language
ANTHR 313	Kinship and Marriage in a Global Perspective
ANTHR 315	Archaeology of North America
ANTHR 322	Peoples and Cultures of Native North America
ANTHR 323	Topics in Latin American Anthropology
ANTHR 323A	Latin American Anthropology: Violence and Memory
ANTHR 323B	Latin American Anthropology: Social movements and Democracy
ANTHR 323C	Latin American Anthropology: Race, Class and Gender
ANTHR 323D	Latin American Anthropology: Regional Focus
ANTHR 323E	Latin American Anthropology: Culture and Sport.
ANTHR 324	Health and Native American Communities
ANTHR 332	Current Issues in Native North America
ANTHR 332A	Current Issues in Native North America: Gender and Family
ANTHR 332B	Current Issues in Native North America: Indigenous Ecologies and Geographies
ANTHR 332C	Current Issues in Native North America: Cultural and Political Movements
ANTHR 332D	Current Issues in Native North America: Regional Focus
ANTHR 336	Culture and Capitalism
ANTHR 340	Magic, Witchcraft, and Religion
ANTHR 354	War and the Politics of Humanitarianism
ANTHR 369	Ancient Egypt
Art History	
Classical Studies	
CL ST 273	Greek and Roman Mythology
CL ST 273H	Greek and Roman Mythology: Honors
CL ST 275	The Ancient City
CL ST 310	Ancient Philosophy
CL ST 350	Rhetorical Traditions
CL ST 353	World Literature: Western Foundations through Renaissance
CL ST 367	Christianity in the Roman Empire
CL ST 368	Religions of Ancient Greece and Rome

CL ST 369	Ancient Egypt
CL ST 372	Greek and Roman Tragedy and Comedy
CL ST 372H	Greek and Roman Tragedy and Comedy: Honors
CL ST 373	Heroes of Greece, Rome, and Today
CL ST 373H	Heroes of Greece, Rome, and Today: Honors
CL ST 374	Sex, Gender, and Culture in the Ancient Mediterranean World
CL ST 376	Classical Archaeology
CL ST 376A	Classical Archeology: Bronze Age and Early Iron Age Greece
CL ST 376B	Classical Archeology: Archaic through Hellenistic Greece (ca 700-30 BCE)
CL ST 376C	Classical Archaeology: Roman Archaeology (ca 1000 BCE-400 CE)
CL ST 383	Greek and Roman Art
CL ST 383H	Greek and Roman Art: Honors
CL ST 384	Roman Italy: An Introduction
CL ST 385	Study Abroad: Roman Italy: Building the Empire
CL ST 394	The Archaeology of Greece: An Introduction
CL ST 395	Study Abroad: The Archaeology of Greece
CL ST 402	Greek Civilization.
CL ST 403	Roman Civilization.
CL ST 430	Foundations of Western Political Thought
COMST 101	Introduction to Communication Studies
COMST 210	Communication and U.S. Diversity
COMST 211	Interpersonal Communication
COMST 214	Professional Communication
COMST 218	Conflict Management
COMST 301	Human Communication Theory
COMST 310	Intercultural Communication
COMST 311	Relational Communication
COMST 313	Leadership Communication Theories
COMST 314	Organizational Communication
COMST 317	Small Group Communication
COMST 319	Communication Training and Development
COMST 325	Nonverbal Communication
DANCE 270	Dance Appreciation
DANCE 360	History and Philosophy of Dance
DSN S 183	Design in Context
Foreign Languages	
History	
HD FS 240	Literature for Children
INTST 235	Introduction to International Studies

L A 371	History of Modern Landscapes, 1750 to Present
Literature (Except ENGL 205)	
MUSIC 102	Introduction to Music Listening
MUSIC 302	Masterpieces of Music and Art in Western Culture.
MUSIC 304	History of American Rock 'n' Roll
MUSIC 383	History of Music I
MUSIC 384	History of Music II
N S 212	Seapower and Maritime Affairs
PHIL 343	Philosophy of Technology
Religious Studies	
THTRE 106	Introduction to the Performing Arts
THTRE 110	Theatre and Society
THTRE 465	Theatre History: Ancient to 19th Century
THTRE 466	Theatre History: 19th Century to Present
WGS 160	Gender Justice
WGS 201	Introduction to Women's and Gender Studies
WGS 203	Introduction to Lesbian Communities
WGS 205	Introduction to Queer Studies
WGS 210	Gender and Sexuality in American Pop Culture
WGS 301	International Perspectives on Women and Gender
WGS 307	Women in Science and Engineering
WGS 308	Write Like a Woman
WGS 320	Ecofeminism
WGS 321	Economics of Discrimination
WGS 323	Gender and Communication
WGS 325	Portrayals of Gender and Sexualities in the Media
WGS 327	Gender and Sexualities in Society
WGS 328	Sociology of Masculinities and Manhood
WGS 333	Women, Gender, and Leadership
WGS 336	Religion, Sex and Gender
WGS 338	Feminist Philosophy
WGS 339	Goddess Religions
WGS 344	Human Reproduction
WGS 345	Women and Literature: Selected Topics
WGS 346	Psychology of Women
WGS 350	Women of Color in the U.S
WGS 352	Queer Literature
WGS 370	Studies in English Translation
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World
WGS 380	History of Women in Science, Technology, and Medicine
WGS 385	Women in Politics

WGS 386	History of Women in America
WGS 401	Feminist Theories
WGS 402	Feminist Research in Action
WGS 422	Women, Men, and the English Language
WGS 425	Intersections of Race, Class and Gender
WGS 430	Gender and Consumer Culture
WGS 435	Gender, Globalization and Development
WGS 440	Gender Issues in Sports
WGS 450	Topics in Women's and Gender Studies
WGS 457	History of American Sexualities
WGS 494	Women/Gender in Art

**Total Credits** **6**

### 18 Other Professional Courses

AESHM 111	Professional Development for AESHM	1
AESHM 111L	AESHM Program Orientation and Learning Community	1
AESHM 211	Leadership Experiences and Development (LEAD)	3
AESHM 311	Seminar on Careers and Internships	1
ACCT 284	Financial Accounting	3
FS HN 111	Fundamentals of Food Preparation	2
FS HN 115	Food Preparation Laboratory	1
AESHM 170D	Supervised Work Experience I: Hospitality	1
AESHM 270D	Supervised Work Experience II: Hospitality	2
HSP M 470	Supervised Professional Internship	3

**Total Credits** **18**

### 40 Hospitality Management Professional Core

AESHM 238	Human Resource Management	3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 340	Hospitality and Apparel Marketing Strategies	3
HSP M 101	Introduction to the Hospitality Industry	3
HSP M 133	Food Safety Certification	1
HSP M 230	Introduction to Hospitality Performance Analysis	3
HSP M 233	Hospitality Sanitation and Safety	3
HSP M 315	Hospitality Law <sup>Spring</sup>	3
HSP M 333	Hospitality Operations Cost Controls <sup>Fall</sup>	3
HSP M 352	Lodging Operations Management I <sup>Fall</sup>	3
HSP M 380	Food Production Management	3
HSP M 380L	Food Production Management Experience	3
HSP M 433	Hospitality Financial Management <sup>Spring</sup>	3
HSP M 455	Strategic Management in Hospitality <sup>Spring</sup>	3

**Total Credits** **40**

### 8-9 Hospitality Management electives

Select from: **8-9**

AESHM 180	First Year Student Field Study
AESHM 222	Creativity on Demand <sup>Spring</sup>
AESHM 281	Orientation to International Field Study
AESHM 380	U.S. Field Study
AESHM 381	International Field Study
AESHM 421	Developing Global Leadership: Maximizing Human Potential <sup>Spring</sup>
AESHM 474	Entrepreneurship in Human Sciences
AESHM 479X	Data Analytics for Apparel, Events, and Hospitality Management
A M D 375	Omni-Channel Retailing
HSP M 201	Casino Management I <sup>Fall</sup>
HSP M 225	Introduction to Food Service Operations <sup>Spring</sup>
HSP M 248	Introduction to Senior Living Management
HSP M 260	Global Tourism Management
HSP M 280	Non-Alcoholic Beverages and Café Operations
HSP M 289	Contemporary Club Management <sup>Spring</sup>
HSP M 301	Hospitality Revenue Management <sup>Fall</sup>
HSP M 320	Attractions and Amusement Park Administration <sup>Spring</sup>
HSP M 358	Economics for Senior Living Management
HSP M 383	Wine and Spirits in Hospitality Management
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management
HSP M 385	Beer and Brewed Beverages in Hospitality Management
HSP M 420	Fairs and Festivals Management
HSP M 437	Hospitality Technology Applications <sup>Fall</sup>
HSP M 452	Lodging Operations Management II <sup>Spring</sup>
HSP M 487	Fine Dining Management <sup>Fall</sup>
EVENT	Only 3 credits of EVENT courses may apply

**Total Credits** **8-9**

### Primary Options:

Select one HSP M professional primary option from the following 6 choices:

### BEVERAGE MANAGEMENT OPTION (9 cr.)

HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 383	Wine and Spirits in Hospitality Management	2
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	2

HSP M 385	Beer and Brewed Beverages in Hospitality Management	1
Additional HSP M Elective Credit		1

**FOODSERVICE MANAGEMENT OPTION (9 cr.)**

HSP M 225	Introduction to Food Service Operations <sup>Spring</sup>	3
HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 487	Fine Dining Management <sup>Fall</sup>	3
<b>Total Credits</b>		<b>9</b>

**LODGING MANAGEMENT OPTION (9 cr.)**

HSP M 301	Hospitality Revenue Management <sup>Fall</sup>	3
HSP M 437	Hospitality Technology Applications <sup>Fall</sup>	3
HSP M 452	Lodging Operations Management II <sup>Spring</sup>	3
<b>Total Credits</b>		<b>9</b>

**SENIOR LIVING MANAGEMENT OPTION (9 cr.)**

HSP M 248	Introduction to Senior Living Management	3
HSP M 358	Economics for Senior Living Management	3
HD FS 234	Adult Development	3
<b>Total Credits</b>		<b>9</b>

**TOURISM AND ATTRACTIONS MGMT OPTION (9 cr.)**

HSP M 260	Global Tourism Management	3
HSP M 320	Attractions and Amusement Park Administration <sup>Spring</sup>	3
HSP M 420	Fairs and Festivals Management	3
<b>Total Credits</b>		<b>9</b>

**GENERAL HOSPITALITY MGMT OPTION (9 cr.)**

Select nine (9) credits from the following: 9

HSP M 201	Casino Management I	
HSP M 225	Introduction to Food Service Operations	
HSP M 248	Introduction to Senior Living Management	
HSP M 260	Global Tourism Management	
HSP M 280	Non-Alcoholic Beverages and Café Operations	
HSP M 289	Contemporary Club Management	
HSP M 301	Hospitality Revenue Management <sup>Fall</sup>	
HSP M 320	Attractions and Amusement Park Administration <sup>Spring</sup>	
HSP M 383	Wine and Spirits in Hospitality Management	
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	
HSP M 385	Beer and Brewed Beverages in Hospitality Management	
HSP M 420	Fairs and Festivals Management	
HSP M 437	Hospitality Technology Applications <sup>Fall</sup>	

HSP M 452	Lodging Operations Management II <sup>Spring</sup>	
<b>Total Credits</b>		<b>9</b>

\* A student who has not had high school chemistry is required to take CHEM 160 Chemistry in Modern Society

\* Grade of C or better required in ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition

\* Grade of C– or better required in all AESHM and HSP M courses.

\* BIOL 101 Introductory Biology required if student has not completed high school biology.

\* CHEM 160 Chemistry in Modern Society required if student has not completed high school chemistry.

\* AESHM 175D Financial Applications for Retail and Hospitality Industries: Hospitality Management required if C+ or lower in MATH credits

**9-11 Electives**

123.0 Total credits

\*\*A student who has not had high school biology is required to take BIOL 101 Introductory Biology.

**Hospitality Management, B.S.****Freshman**

Fall	Credits	Spring	Credits
ENGL 150	3	HSP M 133	1
AESHM 111	1	ECON 101	3
AESHM 111L	1	Social Science Option	3
AESHM 170D	1	AESHM 211	3
HSP M 101	3	HSP M 233	3
FS HN 167	3	HSP M Elective Course	3
Social Science Option	3		
<b>15</b>		<b>16</b>	

**Sophomore**

Fall	Credits	Spring	Credits
ENGL 250	3	MATH	3
LIB 160	1	FS HN 111 or 115	1-2
AESHM 287	3	HSP M 230	3



ACCT 284	3 HSP M "Option" Course	3
AESHM 340	3 General Elective	3
General Elective	3	
<b>16</b>		<b>13-14</b>

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
HSP M 333		3 AESHM 342		3 HSP M 470	3
HSP M 380		3 HSP M 315		3	
HSP M 380L		3 Statistics		3-4	
HSP M 352		3 HSP M "Option" Course		3	
AESHM 270D		2 HSP M Elective Course		3	
AESHM 311		1			
<b>15</b>		<b>15-16</b>	<b>3</b>		

**Senior**

Fall	Credits	Spring	Credits
AESHM 238		3 HSP M 433	3
Speech or Communications Course		3 HSP M 455	3
HSP M "Option" Course		3 HSP M Electives Course	3
Humanities		3 General Elective Course	3-4
General Electives	3		
<b>15</b>		<b>12-13</b>	

**Total Credits: 120-123**US Diversity and International Perspectives Requirement:

Students in HSP M fulfill the US Diversity and International Perspectives Requirements by choosing 3 credits of coursework from each of the University-approved lists.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester

include student ability, employment, health, activities, and grade point consideration.

<sup>1</sup> BIOL 101 required if student has not completed high school biology

<sup>2</sup> When the 4-year plan indicates HSP M Group or General Electives, choice depends on courses available. However, you must have a total of 13-15 credits of HSP M electives and 11-17 credits of General Electives (HSP M courses may be taken to meet General Electives requirements).

<sup>3</sup> CHEM 160 required if student has not completed high school chemistry

## Hospitality Management Minor

A minor in Hospitality Management can be earned by successfully completing the following for a total of 15 credits. The minor must include at least six (6) credits in courses numbered 300 or above taken at ISU. All course prerequisites must be completed prior to taking the course. All minor courses must be taken for a grade. The Hospitality Minor requires students to complete HSP M 101, HSP M 133, and HSP M 233. The remaining 8 credits may be selected from any HSP M designated course, as well as AESHM 238, AESHM 287, AESHM 340, and AESHM 474.

The Hospitality Minor requires students to complete the following courses:

HSP M 101	Introduction to the Hospitality Industry	3
HSP M 133	Food Safety Certification	1
HSP M 233	Hospitality Sanitation and Safety	3
<b>Total Credits</b>		<b>7</b>

The remaining eight (8) credits may be selected from the following:

AESHM 238	Human Resource Management	3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 340	Hospitality and Apparel Marketing Strategies	3
AESHM 474	Entrepreneurship in Human Sciences	3
HSP M 201	Casino Management I	3
HSP M 225	Introduction to Food Service Operations	3
HSP M 230	Introduction to Hospitality Performance Analysis	3
HSP M 248	Introduction to Senior Living Management	3
HSP M 260	Global Tourism Management	3
HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 289	Contemporary Club Management	3
HSP M 301	Hospitality Revenue Management	3
HSP M 315	Hospitality Law	3
HSP M 320	Attractions and Amusement Park Administration	3
HSP M 352	Lodging Operations Management I	3

HSP M 358	Economics for Senior Living Management	3
HSP M 383	Wine and Spirits in Hospitality Management	2
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	2
HSP M 385	Beer and Brewed Beverages in Hospitality Management	1
HSP M 420	Fairs and Festivals Management	3
HSP M 433	Hospitality Financial Management	3
HSP M 437	Hospitality Technology Applications	3
HSP M 452	Lodging Operations Management II	3
HSP M 455	Strategic Management in Hospitality	3

## Beverage Management Minor

The AESHM Department offers a minor in Beverages through the Hospitality Management program. The minor can be earned by successfully completing the following for a total of 15 credits. The minor must include at least six (6) credits in HSP M courses, six (6) credits in courses numbered 300 or above taken at ISU. All course prerequisites must be completed prior to taking the course. All minor courses must be taken for a grade. The Beverages Minor requires students to complete HSP M 101 and HSP M 133. The remaining 11 credits may be selected from any of the courses below.

The Beverage Management Minor requires students to complete the following courses:

HSP M 101	Introduction to the Hospitality Industry	3
HSP M 133	Food Safety Certification	1
<b>Total Credits</b>		<b>4</b>

The remaining eleven (11) credits may be selected from the following:

BBMB 120	The Biochemistry of Beer	2
BBMB 120L	Biochemistry of Beer Laboratory	1
HORT 276	Understanding Grape and Wine Science	3
FS HN 509	Sensory Evaluation of Wines	2
HSP M 280	Non-Alcoholic Beverages and Café Operations	3
HSP M 315	Hospitality Law	3
HSP M 383	Wine and Spirits in Hospitality Management	2
HSP M 383L	Wine, Spirits, and Mixology Laboratory in Hospitality Management	2
HSP M 385	Beer and Brewed Beverages in Hospitality Management	1
HSP M 420	Fairs and Festivals Management	3
HSP M 487	Fine Dining Management	3

## Graduate Study

The Hospitality Management program offers work for the Master of Science and Doctor of Philosophy degrees in hospitality management. Graduates of the program are able to interpret trends and adapt operating practices of hospitality organizations to changing economic, social, political, technological, and environmental conditions. The Master's degree program is designed to prepare individuals for managerial and leadership positions in industry, business, and non-profit organization; teaching careers; and continued graduate study.

The doctoral program is designed to prepare individuals to teach in programs at the university level; provide leadership in non-profit organizations; and/or conduct advanced research at the corporate level or with research firms.

A degree in hospitality management is the usual background for graduate study; however, applicants with preparation in dietetics, business, or closely related fields are encouraged to apply. PhD applicants must have two (2) years of professional work experience in the field.

The Master of Science degree requires either a thesis or non-thesis (creative component) project. Students also are required to take three core courses out of the four offered in the core areas (human resources, financial management, marketing, and strategic management).

The PhD program requires a minimum of 72 credits, up to 30 of which may be applied from the Master's degree. All PhD students take a minimum of 15 research/dissertation credits.

## Human Development and Family Studies

Administered by the Department of Human Development and Family Studies. Leading to the degree of bachelor of science.

Total credits required: 120. The human development and family studies curriculum prepare graduates to pursue careers in helping professions with employment opportunities in government, non-profit, and private agencies, as well as continue on to graduate studies programs.

Students select an option within the major: child development and guidance; advocacy, administration, and policy; or health, well-being, and prevention.

### Student Learning Outcomes

The following set of learning goals was established for the bachelor's degree in Human Development and Family Studies (HD FS). Upon completion of the undergraduate degree in HDFS, students will:

**Learning Objective 1:** Demonstrate an understanding of the central concepts, research, and theories within the field.

**Learning Objective 2:** Demonstrate professional development and self-reflection skills.

**Learning Objective 3:** Demonstrate an ability to access and evaluate peer-reviewed research.

A minor in human development and family studies is available; see requirements under Human Development and Family Studies, Undergraduate Minor.

The following requirements are for the HD FS major by option.

**Child Development & Guidance Option**  
**Human Development and Family Studies Core: 23-24 credits**

HD FS 102	Human Development	3
HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
HD FS 183	Personal Finance in Early Adulthood	1
HD FS 218	Professional Orientation and Service Learning	2
HD FS 369	Research Methods in Human Development and Family Studies	3
HD FS 418B	Professional Practice Reflection/Discussion: Internships	2
HD FS 479	Family Dynamics Through a Social and Cultural Lens	3
HD FS 491	Internship	8-9
<b>Total Credits</b>		<b>23-24</b>

**Individual and Family Development: 12 credits**

Select 4 courses from: 12

HD FS 224	Development in Young Children: Birth through Age 8	
or HD FS 22	Child Development and Health	
Note: HDFS 224 is a prerequisite to HDFS 342 and HDFS 344		
HD FS 226	Development and Guidance in Middle Childhood	
HD FS 227	Adolescence and Emerging Adulthood	
HD FS 234	Adult Development	
HD FS 249	Parenting and Family Diversity Issues	
HD FS 270	Family Communications and Relationships	
HD FS 377	Aging and the Family	
<b>Total Credits</b>		<b>12</b>

**Child Development & Guidance Option: 24 credits**

Emphasis classes. Select 4 from 12-13

HD FS 240	Literature for Children	
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HD FS 342	Social and Emotional Development and Child-centered Guidance in Early Childhood	
HD FS 344	Programming for Children in Early Care and Education	
HD FS 345	Inclusive Teaching and Interaction Strategies	
HD FS 456	Working with Families in Early Intervention	
HD FS 486	Administration of Human Services Programs	
Supporting classes. Select 4 from:		12
HD FS 239	Consumer Issues	
HD FS 276	Human Sexuality	
HD FS 283	Personal and Family Finance	
HD FS 341	Income Tax Planning for Families	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 378	Retirement Planning and Employee Benefits	
HD FS 387	Applying Evidence-Based Practices in Human Services	
HD FS 395	Children, Families, and Public Policy	
HD FS 449	Program Evaluation and Proposal Writing	
<b>Total Credits</b>		<b>24-25</b>

**Communications and Library: 13 credits**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
One of the following:		3
COMST 210	Communication and U.S. Diversity	
COMST 211	Interpersonal Communication	
COMST 218	Conflict Management	
SP CM 212	Fundamentals of Public Speaking	
One of the following:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>13</b>

**Natural Sciences and Mathematical Disciplines: 10-11 credits**

Biology Course		3
STAT 101	Principles of Statistics	4
One of the following:		3-4
COM S 103	Computer Literacy and Applications	

COM S 113 Introduction to Spreadsheets and Databases

**Total Credits** 10-11**Social Sciences: 9 credits**

Select from HD FS list of approved social sciences courses

**Humanities: 6 credits**

Select from HD FS list of approved humanities courses

**Electives: 23-25 credits**

Elective course options may include additional HD FS courses from the Individual and Family Development category that have not been taken and/or HD FS courses from the Health, Wellbeing, and Prevention emphasis section that have not been taken.

**Total credits: 120 credits**

U.S. Diversity and International Perspectives Requirement: Students fulfill the U.S. Diversity and International Perspectives Requirement by choosing three credits of coursework from each of the university-approved lists.

## Health, Well-Being, & Prevention Option

### Human Development and Family Studies Core: 23-24 credits

HD FS 102	Human Development	3
HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
HD FS 183	Personal Finance in Early Adulthood	1
HD FS 218	Professional Orientation and Service Learning	2
HD FS 369	Research Methods in Human Development and Family Studies	3
HD FS 418B	Professional Practice Reflection/Discussion: Internships	2
HD FS 479	Family Dynamics Through a Social and Cultural Lens	3
HD FS 491	Internship	8-9
<b>Total Credits</b>		<b>23-24</b>

**Individual & Family Development: 12 credits**

Select 4 classes from: 12

HD FS 224	Development in Young Children: Birth through Age 8	
or HD FS 223	Child Development and Health	
Note: HDFS 224 is a required prerequisite to HDFS 342 and HDFS 344		
HD FS 226	Development and Guidance in Middle Childhood	
HD FS 227	Adolescence and Emerging Adulthood	

HD FS 234	Adult Development	
HD FS 249	Parenting and Family Diversity Issues	
HD FS 270	Family Communications and Relationships	
HD FS 377	Aging and the Family	

**Total Credits** 12**Health, Well-being, & Prevention Option: 24 credits**

Emphasis classes. Select 4 from: 12

HD FS 276	Human Sexuality	
HD FS 283	Personal and Family Finance	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 387	Applying Evidence-Based Practices in Human Services	

Supporting classes. Select 4 from: 12

		-
		13

HD FS 239	Consumer Issues	
HD FS 240	Literature for Children	
HD FS 341	Income Tax Planning for Families	
HD FS 342	Social and Emotional Development and Child-centered Guidance in Early Childhood	
HD FS 344	Programming for Children in Early Care and Education	
HD FS 378	Retirement Planning and Employee Benefits	
HD FS 395	Children, Families, and Public Policy	
HD FS 449	Program Evaluation and Proposal Writing	
HD FS 486	Administration of Human Services Programs	

**Total Credits** 24-25**Communications and Library: 13 credits**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1

One of the following: 3

COMST 210	Communication and U.S. Diversity	
COMST 211	Interpersonal Communication	
COMST 218	Conflict Management	
SP CM 212	Fundamentals of Public Speaking	

One of the following: 3

ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	

ENGL 314	Technical Communication	
Total Credits		13

Natural Sciences and Mathematical Disciplines: 10-11 credits

Biology Course		3
STAT 101	Principles of Statistics	4
One of the following:		3-4
COM S 103	Computer Literacy and Applications	
COM S 113	Introduction to Spreadsheets and Databases	
Total Credits		10-11

Social Sciences: 9 credits

Select from HD FS list of approved social sciences courses

Humanities: 6 credits

Select from HD FS list of approved humanities courses

Electives: 23-25 credits

Elective course options may include additional HD FS courses from the Individual and Family Development category that have not been taken and/or HD FS courses from the Health, Wellbeing, and Prevention emphasis section that have not been taken.

Total credits: 120 credits

U.S. Diversity and International Perspectives Requirement: Students fulfill the U.S. Diversity and International Perspectives Requirement by choosing three credits of coursework from each of the university-approved lists.

Advocacy, Administration, and Policy Option

Human Development and Family Studies Core: 23-24 credits

HD FS 102	Human Development	3
HD FS 110	Freshman Learning Community Orientation	1
or HD FS 111	New Transfer Student Seminar	
HD FS 183	Personal Finance in Early Adulthood	1
HD FS 218	Professional Orientation and Service Learning	2
HD FS 369	Research Methods in Human Development and Family Studies	3
HD FS 418B	Professional Practice Reflection/Discussion: Internships	2
HD FS 479	Family Dynamics Through a Social and Cultural Lens	3
HD FS 491	Internship	8-9
Total Credits		23-24

Individual & Family Development: 12 credits

Select 4 courses from: 12

HD FS 224	Development in Young Children: Birth through Age 8
or HD FS 225 Child Development and Health	
Note: HDFS 224 is a required prerequisite to HDFS 342 and HDFS 344	
HD FS 226	Development and Guidance in Middle Childhood
HD FS 227	Adolescence and Emerging Adulthood
HD FS 234	Adult Development
HD FS 249	Parenting and Family Diversity Issues
HD FS 270	Family Communications and Relationships
HD FS 377	Aging and the Family

Total Credits 12

Advocacy, Administration, and Policy Option: 24 credits

Emphasis classes (Select 4): 12

HD FS 239	Consumer Issues
HD FS 341	Income Tax Planning for Families
HD FS 378	Retirement Planning and Employee Benefits
HD FS 395	Children, Families, and Public Policy
HD FS 449	Program Evaluation and Proposal Writing
HD FS 486	Administration of Human Services Programs

Supporting classes (Select 4 of the following): 12

		- 13
HD FS 240	Literature for Children	
HD FS 276	Human Sexuality	
HD FS 283	Personal and Family Finance	
HD FS 342	Social and Emotional Development and Child-centered Guidance in Early Childhood	
HD FS 344	Programming for Children in Early Care and Education	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 387	Applying Evidence-Based Practices in Human Services	

Total Credits 24-25

Communications and Library: 13 credits

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1

One of the following:	3
COMST 210 Communication and U.S. Diversity	
COMST 211 Interpersonal Communication	
COMST 218 Conflict Management	
SP CM 212 Fundamentals of Public Speaking	
One of the following:	3
ENGL 302 Business Communication	
ENGL 309 Proposal and Report Writing	
ENGL 314 Technical Communication	
<b>Total Credits</b>	<b>13</b>

## Natural Sciences and Mathematical Disciplines: 10-11 credits

Biology Course	3
STAT 101 Principles of Statistics	4
One of the following:	3-4
COM S 103 Computer Literacy and Applications	
COM S 113 Introduction to Spreadsheets and Databases	
<b>Total Credits</b>	<b>10-11</b>

## Social Sciences: 9 credits

Select from HD FS list of approved social sciences courses

## Humanities: 6 credits

Select from HD FS list of approved humanities courses

## Electives: 23-25 credits

Elective course options may include additional HD FS courses from the Individual and Family Development category that have not been taken and/or HD FS courses from the Health, Wellbeing, and Prevention emphasis section that have not been taken.

## Total credits: 120 credits

U.S. Diversity and International Perspectives Requirement: Students fulfill the U.S. Diversity and International Perspectives Requirement by choosing three credits of coursework from each of the university-approved lists.

# THE COURSES LISTED IN THIS SECTION ARE APPROVED GENERAL EDUCATION COURSE OPTIONS FOR THIS MAJOR.

**Social Sciences:** 9 credits. Coursework designed to help students develop an understanding of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions.

AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
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AF AM 330	Ethnic and Race Relations	3
A M D 165	Dress, Appearance, and Diversity in U.S. Society	3
A M D 362	Cultural Perspectives of Global Dress	3
A M D 467	Consumer Studies in Apparel and Fashion Products	3
AM IN 310	Contemporary Topics in American Indian Studies	3
AM IN 315	Archaeology of North America	3
AM IN 322	Peoples and Cultures of Native North America	3
Anthropology (ANTHR) - except 202		
Economics (ECON)		
FS HN 342	World Food Issues: Past and Present	3
INTST 235	Introduction to International Studies	3
LING 219	Introduction to Linguistics	3
LING 471	Language and Reading Development in Children	3
Political Science (POL S)		
Psychology (PSYCH) - except 131		
Sociology (SOC), including Criminal Justice (C J)		
WGS 201	Introduction to Women's and Gender Studies	3
WGS 203	Introduction to Lesbian Communities	3
WGS 301	International Perspectives on Women and Gender	3
WGS 320	Ecofeminism	3
WGS 327	Gender and Sexualities in Society	3
WGS 328	Sociology of Masculinities and Manhood	3
WGS 346	Psychology of Women	3
WGS 350	Women of Color in the U.S	3
WGS 385	Women in Politics	3

**Humanities:** 6 credits. Coursework designed to assist students to develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.

AESHM 342	Aesthetics of Consumer Experience	3
AF AM 201	Introduction to African American Studies	3
AF AM 334	Africana Religions	3
AF AM 347	Studies in African American Literature	3
AF AM 353	History of African Americans I	3
AF AM 354	History of African Americans II	3
A M D 257	Museum Studies	3
A M D 354	Euro-American Dress History: Prehistoric to Mid-19th Century	3
A M D 356	Euro-American Dress History: Mid-19th Century to the Present	3
AM IN 210	Introduction to American Indian Studies	3
AM IN 240	Introduction to American Indian Literature	3



AM IN 346	American Indian Literature	3
ARCH 221	Histories and Theories of Architecture to 1750	3
ARCH 420	Topics in American Architecture	3
Art History (ART H)		
American Sign Language (ASL)		
Classical Studies (CL ST)		
DANCE 270	Dance Appreciation	3
DANCE 360	History and Philosophy of Dance	3
DSN S 183	Design in Context	3
ENGL 201	Introduction to Literature	3
ENGL 225	Survey of British Literature to 1800	3
ENGL 226	Survey of British Literature since 1800	3
ENGL 227	Survey of American Literature to 1865	3
ENGL 228	Survey of American Literature since 1865	3
ENGL 237	Survey of Film History	3
ENGL 240	Introduction to American Indian Literature	3
History (HIST)		
HSP M 260	Global Tourism Management	3
MUSIC 102	Introduction to Music Listening	3
MUSIC 302	Masterpieces of Music and Art in Western Culture.	3
MUSIC 304	History of American Rock 'n' Roll	3
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3
Philosophy (PHIL)		
Religious Studies (RELIG)		
THTRE 106	Introduction to the Performing Arts	3
THTRE 110	Theatre and Society	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
WGS 201	Introduction to Women's and Gender Studies	3
WGS 336	Religion, Sex and Gender	3
WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
WGS 370	Studies in English Translation	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3
World Languages and Cultures (ARABC, CHIN, FRNCH, GER, GREEK, RUS, SPAN)		

## Human Development and Family Studies, B.S.-Child Development & Guidance option

### Freshman

Fall	Credits	Spring	Credits
HD FS 102	3	HD FS 183	1
HD FS 110 or 111	1	Biology Course <sup>***</sup>	3
LIB 160	1	Social Sciences Course <sup>***</sup>	3
ENGL 150	3	Elective Courses <sup>***</sup>	6
PSYCH 131 (recommended elective)	1	Individual and Family Development Course	3
Social Sciences Course <sup>***</sup>	3		
Humanities Course <sup>***</sup>	3		
<b>15</b>		<b>16</b>	

### Sophomore

Fall	Credits	Spring	Credits
ENGL 250	3	SP CM 212, COMST 210, COMST 211, or COMST 218	3
STAT 101	4	General Education: COM S 103 or COM S 113	3
HD FS 218	2	Child Dev & Guide Supporting Course	3
Individual & Family Development Course	3	Humanities Course <sup>***</sup>	3
Social Science Course <sup>***</sup>	3	Elective <sup>*</sup>	3
<b>15</b>		<b>15</b>	

### Junior

Fall	Credits	Spring	Credits
HD FS 369	3	HD FS 479	3
Individual & Family Development Course	3	Child Dev & Guide Emphasis Course	6
Child Dev & Guide Supporting Course	3	Individual and Family Development Course	3
Child Dev & Guide Emphasis Course	3	Electives <sup>*</sup>	4
Elective <sup>*</sup>	4		
<b>16</b>		<b>16</b>	

### Senior

Fall	Credits	Spring	Credits
HD FS 418B	2	HD FS 491 <sup>^</sup>	8-9
ENGL 302, 309, or 314	3	Electives <sup>*</sup>	4
Child Dev & Guide Emphasis Course	3		
Child Dev & Guide Supporting Course	6		

Electives	1	
	<b>15</b>	<b>12-13</b>

\* Total number of electives will vary. A minimum of 120 credits are required to graduate.

\*\*\* See HD FS General Education Selections sheet.

^ HD FS 418B is prerequisite to HD FS 491 Internship, and requires junior classification.

- ISU requires 3 credits of U.S. Diversity coursework and 3 credits of International Perspectives coursework.

## Human Development and Family Studies, B.S.- Advocacy, Administration, & Policy option

### Freshman

Fall	Credits Spring	Credits
HD FS 102	3 HD FS 183	1
HD FS 110 or 111	1 Individual and Family Development Course	3
LIB 160	1 Social Sciences Course***	3
ENGL 150	3 Biology	3
PSYCH 131 (recommended elective)	1 Electives*	6
Social Sciences Course***	3	
Humanities Course***	3	
	<b>15</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ENGL 250	3 SP CM 212, COMST 210, COMST 211, or COMST 218	3
STAT 101	4 COM S 103 or 113	3
Individual and Family Development Course	3 Advocacy Administration and Policy Focus: Supporting course	3
HD FS 218	2 Humanities Course***	3
Social Sciences Course***	3 Electives*	3
undefined		
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
HD FS 369	3 HD FS 479	3
Individual & Family Development Course	3 Individual & Family Development Course	3
Adv, Admin, & Policy Supporting Course	3 Adv, Admin, & Policy Emphasis Course	3

Adv, Admin, & Policy	3 Adv, Admin, & Policy	3
Emphasis Course	Emphasis Course	
Elective*	4 Electives*	4
	<b>16</b>	<b>16</b>

### Senior

Fall	Credits Spring	Credits
Adv, Admin, & Policy	3 HD FS 491^	8-9
Emphasis Course		
Adv, Admin, & Policy	6 Electives*	4
Supporting Course		
HD FS 418B	2	
ENGL 302, 309, or 314	3	
Electives*	1	
	<b>15</b>	<b>12-13</b>

\* Total number of electives will vary. A minimum of 120 credits are required to graduate

\*\*\* See HD FS General Education Selections sheet

^ HD FS 418B is prerequisite to HD FS 491 Internship and requires junior classification.

- ISU requires 3 credits of U.S. Diversity coursework and 3 credits of International Perspectives coursework.

## Human Development and Family Studies, B.S.-Health, Well-Being, & Prevention option

### Freshman

Fall	Credits Spring	Credits
HD FS 102	3 HD FS 183	1
HD FS 110 or 111	1 Social Sciences Courses***	3
LIB 160	1 Electives	6
ENGL 150	3 Individual and Family Development Course	3
PSYCH 131 (recommended elective)	1 Biology	3
Social Sciences Course***	3	
Humanities Course***	3	
	<b>15</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ENGL 250	3 SP CM 212, COMST 210, COMST 211, or COMST 218	3
HD FS 218	2 Health Wellbeing and Prevention Focus Supporting Course	3
STAT 101	4 Humanities***	3

Individual and Family Development Course	3 Elective *	3
Social Sciences Course ***	3 COM S 103 or 113	3
<b>15</b>		<b>15</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
HD FS 369	3 HD FS 479	3
Individual & Family Development Course	3 Individual & Family Development Course	3
Health, W-B, & Prev Emphasis Course	3 Health, W-B, & Prev Emphasis Course	3
Health, W-B, & Prev Supporting Course	3 Health, W-B, & Prev Supporting Course	3
Electives *	4 Electives *	4
<b>16</b>		<b>16</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
HD FS 418B	2 HD FS 491 ^	8-9
ENGL 302, 309, or 314	3 Electives *	4
Health, W-B, & Prev Emphasis Course	3	
Health, W-B, & Prev Supporting Course	6	
Electives *	1	
<b>15</b>		<b>12-13</b>

\* Total number of electives will vary. A minimum of 120 credits are required to graduate.

\*\*\* See HD FS General Education Selections sheet

^ HD FS 418B is prerequisite to HD FS 491 Internship, and requires junior classification.

- ISU requires 3 credits of U.S. Diversity coursework and 3 credits of International Perspectives coursework.

The **Human Development and Family Studies** minor may be earned by completing 15 credits

HD FS 102	Human Development	3
One of the following:		3
HD FS 223	Child Development and Health	
HD FS 226	Development and Guidance in Middle Childhood	
HD FS 227	Adolescence and Emerging Adulthood	
HD FS 234	Adult Development	
HD FS 249	Parenting and Family Diversity Issues	
HD FS 270	Family Communications and Relationships	

HD FS 377	Aging and the Family	
Three of the following:		9
HD FS 276	Human Sexuality	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 387	Applying Evidence-Based Practices in Human Services	
HD FS 395	Children, Families, and Public Policy	
HD FS 449	Program Evaluation and Proposal Writing	
HD FS 479	Family Dynamics Through a Social and Cultural Lens	
<b>Total Credits</b>		<b>15</b>

## GRADUATE PROGRAMS

More information on the variety of graduate programs offered through the Department of Human Development and Family Studies can be found here: <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/>.

## Human Development and Family Studies Department

The Department of Human Development and Family Studies offers courses that focus on the interactions among individuals, families, their resources, and their environments throughout the life span. The department offers work for the Bachelor of Science degree in five curricula: Early Childhood Education, Family and Consumer Sciences Education and Studies, Financial Counseling and Planning, Human Development and Family Studies, and an affiliated program: Early Childcare Education and Programming (a distance education program offered in collaboration with six other universities).

Students graduating in Human Development and Family Studies will

1. Communicate with clear purpose, workable organization and effective style in written, oral, visual and electronic (WOVE) formats to foster collaboration, provide information and advance knowledge related to child, adult, family, and community services.
2. Consistently and realistically analyze and evaluate one's own knowledge, abilities and actions in comparison to professional standards and create action plans to enhance personal and professional efficacy related to working with children, adults, families and communities.
3. Understand content related to working with children, adults, families, and communities within a chosen program. Use critical thinking skills to evaluate and utilize evidence-based practices. Use logical and ethical reasoning to make decisions and solve problems.

4. Understand the diverse needs of children, adults, and families. Ensure equitable access of children, adults, and families to appropriate environments that support healthy living. Engage children, adults, and families with socially responsible and respectful behavior.

**Communication Proficiency requirement:** A student must achieve a grade of C or higher in ENGL 150, Critical Thinking and Communication, and ENGL 250, Written, Oral, Visual, and Electronic Composition. A student achieving a grade of C– or lower in 150 and/or 250 must either repeat the course(s), earning a minimum grade of C, or, in consultation with the advisor and the coordinator of freshman English, complete another appropriate English writing course with a minimum grade of C.

The **Human Development and Family Studies** curriculum leads to work in helping professions with employment opportunities in public and private agencies. Graduates of the program are prepared for employment in agencies and organizations serving children, youth, families, and adults in the areas of education/prevention, treatment, and administration. This flexible program provides a broad emphasis in theory, research, and application in child, adult and family services including attention to community issues and public policy.

Students in Human Development and Family Studies may choose coursework that leads to becoming a Certified Family Life Educator (CFLE), a program that has been approved by the National Council on Family Relations. These courses provide the basic education for students interested in working with families, including adolescents, parents, or adults working to strengthen relationships. The student takes courses that support the development of knowledge and skills in family life content areas selected by the National Council on Family Relations. The certification is a voluntary credential that requires the individual to complete a degree in an approved program and to have at least two years of work experience in family life education settings. Iowa State University does not grant the Certified Family Life Educator credential. The certification is granted only by the National Council on Family Relations. See <https://hdfs.hs.iastate.edu/future-students/find-your-major/certified-family-life-educator/> and/or <http://www.ncfr.org/cfle-certification/>.

The curriculum in **Early Childhood Education – Unified** prepares graduates to teach young children and work with their families. This curriculum has been approved by the Iowa Department of Education and meets requirements for candidates to seek teacher licensure in early childhood education – unified, which permits individuals to teach general and special education for children from birth through third grade. Graduates may be employed by either public or private agencies or schools to teach in early childhood classrooms (preschool through third grade) or in home-based programs. The program is an interdepartmental major administered by the Department of Human Development and Family Studies and the School of Education. For more

information about the program, see <https://hdfs.hs.iastate.edu/find-your-major/early-childhood-education/>.

Students who enroll in the early childhood education – unified program must apply to and be accepted into the teacher education program prior to enrolling in advanced courses.

**Family and Consumer Sciences Education and Studies** offers a curriculum for the Bachelor of Science degree. (<http://catalog.iastate.edu/collegeofhumansciences/familyandconsumerscienceseducationandstudies>)

The curriculum in Family and Consumer Sciences Education and Studies (FCEDS) prepares graduates with a broad understanding of individual and family well-being. Graduates apply knowledge and research in family and consumer sciences content in global professional settings. They work in an integrative fashion to improve well-being by addressing and acting on complex problems confronting individuals, families, and communities. The study of Family and Consumer Sciences Education incorporates the following 16 content areas ([https://opi.mt.gov/Portals/182/Page%20Files/Career%20%26%20Technical%20Education/Docs/FCS/15FCS\\_NationalStandards.pdf](https://opi.mt.gov/Portals/182/Page%20Files/Career%20%26%20Technical%20Education/Docs/FCS/15FCS_NationalStandards.pdf)): Career, Community and Family Connections; Consumer and Family Resources; Consumer Services; Education and Early Childhood; Facilities Management and Maintenance; Family; Family and Community Services; Food Production and Services; Food Science, Dietetics, and Nutrition; Hospitality, Tourism and Recreation; Housing and Interior Design; Human Development; Interpersonal Relationship; Nutrition and Wellness; Parenting; and Textiles, Fashion and Apparel.

Students in the program choose one of three options, Teacher Licensure, Communications, or Professional Studies.

Students in Family and Consumer Sciences Education and Studies may choose coursework that leads to becoming a Certified Family Life Educator (CFLE), a program that has been approved by the National Council on Family Relations. These courses provide the basic education for students interested in working with families, including adolescents, parents, or adults working to strengthen relationships. The student takes courses that support the development of knowledge and skills in family life content areas selected by the National Council on Family Relations. The certification is a voluntary credential that requires the individual to complete a degree in an approved program and to have at least two years of work experience in family life education settings. Iowa State University does not grant the Certified Family Life Educator credential. The certification is granted only by the National Council on Family Relations. See <https://hdfs.hs.iastate.edu/future-students/find-your-major/certified-family-life-educator/> and/or <http://www.ncfr.org/cfle-certification/>.

Graduates may also choose from one of several nationally recognized professional certifications available from the American Association of Family and Consumer Sciences (AAFCS) Council for Certification. This program measures competencies of FCS professionals using high-quality, rigorous assessments. Certifications that are currently available are (<http://www.aafcs.org/home> (<https://www.aafcs.org/home/>)): CFCS: Certified in Family and Consumer Sciences; CFCS-HDFS: Certified in Human Development and Family Studies; CFCS-HNFS: Certified in Hospitality, Nutrition, and Food Science; and CPFFE: Certified Personal and Family Finance Educator.

There is also an opportunity to take courses that will allow you to be recommended for a family and consumer sciences endorsement or teacher licensure as a post baccalaureate student.

The **Financial Counseling and Planning (FCP)** curriculum prepares students for careers in family financial services. Financial Counseling and Planning is a growing career field and appeals to students who want to work with individuals and families to help them meet their financial goals and improve their financial capability to better meet financial challenges. Coursework provides students with the family resource management and interpersonal skills needed to help families remain financially secure. Based on career goals, students select a path that leads to fulfilling the education requirements for the leading designations and certifications in financial counseling and planning. Graduates of the program are prepared for employment in personal banking, financial services, insurance, financial counseling and planning, and human service organizations. Laboratory and practicum opportunities exist in the Iowa State University Financial Counseling Clinic and with program partners in the financial services industry. A field work experience helps students apply their studies and experience the profession in real-world settings.

Financial Counseling and Planning majors are also prepared to enter graduate programs in family financial planning, financial education, economics, finance, and law.

Juniors and seniors in Financial Counseling and Planning who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both a B.S. in Financial Counseling and Planning and a M.S. in Human Development and Family Studies or a B.S. in Financial Counseling and Planning and a Graduate Certificate in Family Financial Planning. Under concurrent enrollment, students simultaneously take undergraduate and graduate courses and may be eligible for assistantships. See Graduate Study for more information (<https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/>).

The Financial Counseling and Planning major is registered with Certified Financial Planner Board of Standards Inc. as a CFP Board-registered

Program. ISU courses satisfy CFP Board's education requirement, allowing an individual to sit for the CFP® Certification Examination.

Iowa State University does not certify individuals to use the CFP® CERTIFIED FINANCIAL PLANNER™ title. CFP certification is granted only by Certified Financial Planner Board of Standards Inc. to those persons who, in addition to completing an educational requirement such as this CFP Board-Registered Program, have met its ethics, experience and examination requirements (CFP Board of Standards website <https://www.cfp.net/>).

Certified Financial Planner Board of Standards Inc. owns the certification marks CFP®, CERTIFIED FINANCIAL PLANNER™ and the federally registered CFP (with flame logo), which it awards to individuals who successfully complete initial and ongoing certification requirements.

FCP majors also satisfy the education requirements for the Accredited Financial Counselor (AFC®) designation offered through the Association for Financial Counseling and Planning Education (AFCPE).

## Affiliated Programs

The **Early Childcare Education and Programming (E C P)** curriculum, offered by the Great Plains Interactive Distance Education Alliance (GPIDEA), is designed to prepare graduates to work in a variety of early care and education programs in local communities and on military installations. Some of these programs are childcare centers and homes, infant/toddler and preschool programs, Head Start programs, and before and after-school programs for children ages birth to eight. This is an online program offered through a collaboration of seven universities as part of GPIDEA where the program is referred to as Early Care and Education for a Mobile Society. For more information see <https://www.gpidea.org/program/early-care-and-education-in-a-mobile-society> (<https://www.gpidea.org/program/early-care-and-education-in-a-mobile-society/>).

The E C P curriculum is designed to provide content for the final two years of a student's program; the content is focused specifically on topics directly relevant to the major. Students will complete a total of 120 credits for the major, 51 of which are specific to the E C P curriculum. These 51 credit hours are comprised of 12 core courses and 3 practica; the final practicum will be a 6-credit capstone experience. Students must complete 30 credits of college work, a lifespan development course, and have a 2.5 GPA to be admitted to E C P. If students prefer to be admitted to ISU before being admitted to the E C P major, they can enroll as Pre ECP (P ECP) students until they are eligible for the E C P major. For more information about the program at Iowa State, see <https://online.hs.iastate.edu/early-childcare-programming> (<https://online.hs.iastate.edu/early-childcare-programming/>).

## Curricula:

- **Early Childhood Education – Unified**
- **Family and Consumer Sciences Education and Studies**
- **Financial Counseling and Planning**
- **Human Development and Family Studies**
- Affiliated Program: Early Childcare Education and Programming (GPIDEA program)

## Minors

The department offers minors in Human Development and Family Studies and Financial Counseling and Planning. Minors consist of at least 15 credits including 6 credits taken at Iowa State University in courses numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

The **Human Development and Family Studies** minor may be earned by completing 15 credits

HD FS 102	Human Development	3
One of the following:		3
HD FS 223	Child Development and Health	
HD FS 226	Development and Guidance in Middle Childhood	
HD FS 227	Adolescence and Emerging Adulthood	
HD FS 234	Adult Development	
HD FS 249	Parenting and Family Diversity Issues	
HD FS 270	Family Communications and Relationships	
HD FS 377	Aging and the Family	
Three of the following:		9
HD FS 276	Human Sexuality	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 387	Applying Evidence-Based Practices in Human Services	
HD FS 395	Children, Families, and Public Policy	
HD FS 449	Program Evaluation and Proposal Writing	
HD FS 479	Family Dynamics Through a Social and Cultural Lens	
<b>Total Credits</b>		<b>15</b>

The **Education Services in Family and Consumer Sciences** minor may be earned by completing 15 credits

HD FS 102	Human Development	3
FCEDS 206	Professional Roles in Family and Consumer Sciences	2
FCEDS 306	Educational Principles for Family and Consumer Sciences	4
FCEDS 413	Planning and Assessment for Family and Consumer Sciences	3
One of the following:		3
FCEDS 418	Foundations of Career and Technical Education in Family and Consumer Sciences	
HD FS 341	Income Tax Planning for Families	
HD FS 360	Housing and Services for Families and Children	
HD FS 367	Abuse and Illness in Families	
HD FS 373	Death as a Part of Living	
HD FS 395	Children, Families, and Public Policy	

The **Financial Counseling and Planning** minor may be earned by completing 15 credits

HD FS 283	Personal and Family Finance	3
Twelve credits from the following:		12
HD FS 239	Consumer Issues	
HD FS 341	Income Tax Planning for Families	
HD FS 378	Retirement Planning and Employee Benefits	
HD FS 383	Fundamentals of Financial Planning	
HD FS 384	Family Insurance Planning	
HD FS 482	Family Savings and Investments	
HD FS 484	Estate Planning for Families	
HD FS 485	Capstone: Family Financial Planning	
HD FS 489	Financial Counseling	
HD FS 489L	Financial Counseling Laboratory	
<b>Total Credits</b>		<b>15</b>

## Graduate Study

The department offers work for the Master of Science (thesis or non-thesis options) and Doctor of Philosophy degrees with the major in Human Development and Family Studies. Minors are also available for students taking major work in other departments. Graduates of M.S. and Ph.D. programs in the department will understand and apply relevant theories to educational, research, and/or intervention or prevention programs. It is intended that they will produce and disseminate research results and provide leadership in human development and family studies professions.

Graduate study in Human Development and Family Studies at Iowa State University is multidisciplinary and focuses on research and practice in



several content areas such as adolescent/youth development, adult development and aging, family studies and policy, family economic well-being and financial planning, infant and child development, health and well-being; and lifespan development.

Prerequisite to work in the major is the completion of a related undergraduate program with basic courses and/or experiences in areas such as child/human development, community and regional planning, economics, education, family studies, psychology, or sociology. Additional coursework or prerequisites (e.g., basic statistics) may be required depending on the undergraduate program and program of study. Students may be admitted to our doctoral program with either a bachelor's (M.S./Ph.D. Track, 5 years) or a master's degree (Ph.D. Track only, 3 years). Students admitted to the Ph.D. Track without a prior master's degree complete requirements for a thesis-based master's degree as part of their doctoral program of study.

All students take a core set of courses; the program of study is then completed with a selection of courses that meet the individual needs of the student. The variety of and flexibility in the coursework allows a student to tailor a program to specific academic interests. The graduate programs are based on a theory, research, and application interactive paradigm with all three areas integrated into content and method courses.

The department offers a graduate minor in Human Development and Family Studies. For more detailed information about the minor, see the Graduate Minors tab.

The department also offers four Graduate Certificates available to HD FS majors as well as students in other departments and professionals in the field.

The department also participates in several Master of Family and Consumer Sciences (MFCS) degree programs (<http://catalog.iastate.edu/collegeofhumansciences/familyandconsumersciences/>). Admission to the youth (YTH), family financial planning (FFP) and gerontology (GERON) specialization programs require submission of the Graduate College application form, transcripts, 2 letters of recommendation, resume and a goal statement. Students in a MFCS program select one of the options listed below.

1. Master of Family and Consumer Sciences - Human Development and Family Studies (MFCS-HDFS). The Master of Family and Consumer Sciences degree specialization track in Human Development and Family Studies (HDFS) provides students with the opportunity to enhance their background knowledge and skills for working with children and families (37 credits).
2. Master of Family and Consumer Sciences - Youth Development (MFCS-YD). This is an entirely online degree focusing on the skills to serve today's young people. The degree uses a strengths-based

curriculum that supports you to grow socially, emotionally, and cognitively. There are also two youth development related certificates available for students (see Graduate Certificates tab for details) (36 credits).

3. Master of Family and Consumer Sciences - Family Financial Planning Program (MFCS-FFP). This is a master's degree program offered entirely online, designed to prepare individuals to work in the financial planning field (36 credits). Completion of course work in the master's degree or a graduate certificate meets the educational requirements to sit for the Certified Financial Planner (CFP) Board of Standards Certification Examination.

The department offers a Financial Counseling and Planning (FCP) concurrent degree program that allows students to obtain a B.S. in FCP and an M.S. in HD FS or a B.S. in FCP and a Graduate Certificate in Family Financial Planning in 5 years. Application for admission to the Graduate College should be made near the end of the junior year. Under concurrent enrollment, students simultaneously take undergraduate and graduate courses and may be eligible for assistantships. Students interested in these programs should contact the department for details.

Finally, the department collaborates with the interdepartmental Gerontology program; students may declare a minor in Gerontology. The Master of Family and Consumer Sciences - Gerontology program (MFCS-GERON) and the Graduate Gerontology Certificate program are designed to prepare professionals who work directly with older people or are involved in education and research related to older adults. Professionals offering direct services often are involved in health promotion programs, directing inter-generational activities, managing senior centers or retirement communities, counseling older people and their families, and helping people plan for retirement. Professionals involved in education and research may evaluate community-based services, teach others about the aging process, develop policies and programs to serve the needs of older adults, and work with business and industry on issues related to an aging work force.

## Graduate Minors

The department offers a graduate minor in Human Development and Family Studies. To earn this minor, students in a Master's program must take 9 credits in HD FS graduate courses (500, 600 level) with a limit of 3 credits in seminar or workshop credit (credits in 591 or 691 not allowed). To earn a minor in HD FS students in a Doctoral program must take 12 credits in HD FS graduate courses (500, 600 level) with a limit of 3 credits in seminar or workshop credit (credits in 591 or 691 not allowed). A graduate faculty member from the minor program must serve on the student's POS Committee.

## HD FS Certificates

The department offers four Graduate Certificates available to HD FS majors as well as students in other departments and professionals in the field. The certificates emphasize application and relevance to growing diversity and demands on the work force. The four certificate areas are:

1. Developmental and Family Sciences Advanced Research Design and Methods (15 credits)
2. Family Well-Being in Diverse Society (12 credits)
3. Infant and Early Childhood Mental Health (12 credits, online)
4. Life-Span Development (12 credits, online)

For more information about courses for the certificates, go to <https://hdfs.hs.iastate.edu/graduate-students/graduate-programs/graduate-certificates/>

## Youth Development Certificates

The department also collaborates to offer two certificates related to youth development through the MFCS program. Both certificates are designed to prepare individuals who work directly with youth or are involved in education and research related to youth. For more information, go to <http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-youth-development/>.

1. Youth Development Specialist Certificate (13 credits)
2. Youth Program Management and Evaluation Certificate (13 credits)

## Family Financial Planning Certificates

The MFCS – Family Financial Planning (FFP) program also offers two certificates listed below. More information can be found at <http://www.online.hs.iastate.edu/graduate-programs/masters/mfcs-ffp/>.

1. FFP certificate. Master of Family and Consumer Sciences with Family Financial Planning (FFP) specialization graduate certificate program (18 credits)
2. FHC certificate. Master of Family and Consumer Sciences Financial and Housing Counseling (FHC) specialization graduate certificate program (18 credits)

**Courses primarily for undergraduates:**

### HD FS 102: Human Development

(3-0) Cr. 3. F.S.SS.

Overview of life-span developmental tasks (physical, cognitive, language, social, emotional) examined from various theoretical perspectives.

Discussion of topics related to family diversity, individual/family health and well-being and reciprocal relationships as affected by external factors.

### HD FS 110: Freshman Learning Community Orientation

(1-0) Cr. 1. F.

*Prereq: Membership in HD FS Learning Community*

Introduction to the Department of Human Development and Family Studies including academic requirements and opportunities, strategies for transitioning to college, learning and study strategies, reading and reflection, and career awareness.

### HD FS 111: New Transfer Student Seminar

(1-0) Cr. 1. F.S.

Introduction to HD FS curricula and faculty for students in CH FS, FCEDS or F C P. Department and University policies and procedures, degree audits, and registration. Exploration of campus resources and strategies for student success. Offered on a satisfactory-fail basis only.

### HD FS 183: Personal Finance in Early Adulthood

(1-0) Cr. 1. F.S.SS.

Introduction to basic concepts and budgeting practices for management of resources and prevention of financial problems commonly associated with college, including credit and student loans. Offered on a satisfactory-fail basis only.

### HD FS 208: Early Childhood Education Teacher Orientation

Cr. 1. F.S.

*Prereq: Early Childhood Education major*

Overview of early childhood education (birth-grade 3) teacher licensure requirements. Program planning and university procedures. Required of all students majoring in early childhood education. Offered on a satisfactory-fail basis only.

### HD FS 218: Professional Orientation and Service Learning

(2-0) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in HD FS 102; major in Human Development and Family Studies*

Ethics, professional development, and career exploration in child, adult and family services. Visits to and service learning with programs that serve children, adults and families with diverse needs. Participation in service learning project required.

### HD FS 223: Child Development and Health

(3-0) Cr. 3. S.

Typical and atypical development of children prenatal through middle childhood. Examination of healthy development and potential impact of health issues in children. Discussion of influence of the family and society on development. Either HD FS 223 or HD FS 224, but not both, may be applied toward graduation.

**HD FS 224: Development in Young Children: Birth through Age 8**

(3-1) Cr. 3. F.S.

*Prereq: HD FS 102*

Learning, growth, and development (typical and atypical) of children from birth through age eight. Explores importance of family, programs, and a diverse society. Strategies for observing, recording, and interpreting children's cognitive, communication, motor, social, and emotional development. Practicum. Either HD FS 223 or HD FS 224, but not both, may be applied toward graduation.

**HD FS 226: Development and Guidance in Middle Childhood**

(3-0) Cr. 3. F.

*Prereq: HD FS 102 or PSYCH 230*

Physical, cognitive, socioemotional, and identity development from 5 to 12 years of age. Development within the contexts of family, school, peers, and society. Guidance of children in family and group settings.

**HD FS 227: Adolescence and Emerging Adulthood**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 102 or PSYCH 230*

Physical, cognitive, and socioemotional development of adolescents and emerging adults in the context of family, relationships, and culture.

**HD FS 234: Adult Development**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: HD FS 102 or PSYCH 230*

Introductory exploration of the health, individual and social factors associated with adult development including younger adulthood, middle age and older adulthood. Information is presented from a life-span developmental framework.

**HD FS 239: Consumer Issues**

(3-0) Cr. 3. F.S.

Introduction to factors affecting consumer decisions of individuals and families, including housing, healthcare, and personal finances. Emphasis on accessibility and affordability, community contexts for families; and consumer protection, legislation and regulation, and consumer fraud. Meets U.S. Diversity Requirement

**HD FS 240: Literature for Children**

(3-0) Cr. 3. F.S.

Evaluation of literature for children, including an emphasis on diversity and inclusion; cultural competence. Roles of literature in the overall development of children. Literature selection and use in the home and educational settings.

**HD FS 249: Parenting and Family Diversity Issues**

(3-0) Cr. 3. F.S.

Evidence-based, best-practice approaches to child-rearing, guidance, adult-child relationships, and parenting education programs. Theoretical perspectives related to caregiving processes across the lifespan.

**HD FS 270: Family Communications and Relationships**

(3-0) Cr. 3. F.S. Alt. SS., offered odd-numbered years.

Family communication and its functions to develop, maintain, enrich and limit family relationships. Family theories related to communication and ethical considerations when working with families.

**HD FS 276: Human Sexuality**

(3-0) Cr. 3. F.S. SS.

Behavioral, biological, and psychological aspects of human sexuality within the social context of family, culture, and society. Role of sexuality in human development. Critical analysis of media and research. Communication and decision-making skills relating to sexuality issues and relationships.

Meets U.S. Diversity Requirement

**HD FS 283: Personal and Family Finance**

(3-0) Cr. 3. F.S.

Introduction to basic principles of personal and family finance. Budgeting, record keeping, checking and savings accounts, consumer credit, insurance, investments, and taxes.

Meets U.S. Diversity Requirement

**HD FS 283H: Personal and Family Finance: Honors**

(3-0) Cr. 3. F.S.

Introduction to basic principles of personal and family finance. Budgeting, record keeping, checking and savings accounts, consumer credit, insurance, investments, and taxes. Additional work required to meet Honors requirements.

Meets U.S. Diversity Requirement

**HD FS 317: Field Experiences**

Cr. 1-6. Repeatable. F.S. SS.

*Prereq: Permission of Instructor*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 317B: Field Experiences: Human Development and Family Studies**

Cr. 1-6. Repeatable. F.S. SS.

*Prereq: 9 credits in HD FS; Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 317G: Field Experiences: Family Finance Programs**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs.

**HD FS 317H: Field Experiences: Honors**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: 9 credits in HD FS; Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 340: Assessment and Curriculum: Ages Birth through 2 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224; admission to Educator Preparation program*

Assessment strategies for infants and toddlers, including those with special needs. Curricula, learning environments, teaching strategies, health and nutritional practices, and schedules that are developmentally, individually, and culturally appropriate. Using assessment to plan, implement, and evaluate activities to promote physical, motor, cognitive, communication, and social emotional development. Practicum.

**HD FS 341: Income Tax Planning for Families**

(3-0) Cr. 3. F.

Practice and planning to minimize tax liability and maximize after-tax returns for individuals and families. Addresses components of the US personal income tax system including tax forms, filing status, income, exemptions, exclusions, deductions, adjustments, credits, penalties, and tax rates. The case-problem approach prepares students to plan for themselves and to advise others.

**HD FS 342: Social and Emotional Development and Child-centered Guidance in Early Childhood**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 224*

Guiding prosocial development, self-regulation, and task engagement of children birth to age 8. Focus is on promoting prosocial behaviors through supportive relationships and environments within diverse home, center, or school settings. Functional behavior assessment and ongoing progress monitoring for targeted and intensive interventions. Practicum. Must take HD FS 340, 343, or 344 the same semester.

**HD FS 343: Assessment and Curriculum: Ages 3 through 6 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224; HD FS 240; admission to Educator Preparation program*

Assessment strategies for preschool and kindergarten children, including those with special needs. Learning environments, schedules, activities, nutritional practices, and teaching strategies that are developmentally, individually, and culturally appropriate. Using assessment to plan, implement, and evaluate activities to promote physical motor, cognitive, communication, and social emotional development. Practicum.

**HD FS 344: Programming for Children in Early Care and Education**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224*

Programming in inclusive child care centers and family child care homes, including those with special needs, aged birth through 8 years. Developing, implementing, and evaluating learning environments; activities and materials; behavioral guidance and classroom management practices; health and nutritional practices; and schedules to ensure developmental, individual, and cultural appropriateness. Monitoring children's development and behavior to promote physical, motor, cognitive, communication, and social emotional development. Learning to collaborate effectively with parents and staff. Practicum.

**HD FS 345: Inclusive Teaching and Interaction Strategies**

(3-0) Cr. 3. F.S.

*Prereq: (HD FS 224; SP ED 250) or Permission of Instructor*

Instructional strategies, adaptations and specialized materials and equipment to meet the developmental needs of all young learners ages birth through 8 years old, especially those with diverse learning needs and multiple disabilities. Addressing inclusivity, the history of early childhood special education, and the planning and writing of individualized education plans.

**HD FS 360: Housing and Services for Families and Children**

(3-0) Cr. 3. F.

*Prereq: 6 credits from the following courses: AESHM 421; AF AM 330; AMD 165, 362, 467; AM IN 310, 215, 322; ANTHR (except 202); CJ (except 220, 332); ECON; FS HN 342; INTST 235; LING 219, 275, 471; POL S; PSYCH (except 131); SOC; WGS 201, 203, 301, 320, 327, 328, 346, 350, 385*

Approaches to and assessment of housing and services that assist those with special needs including those with disabilities, low-income, children at risk, single-parents, and the homeless. Emphasis on community settings; e.g., residential facilities, group housing, shelters and transitional housing.

**HD FS 367: Abuse and Illness in Families**

(3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: 3 credits from the following courses: AESHM 421; AF AM 330; AMD 165, 362, 467; AM IN 310, 215, 322; ANTHR (except 202); CJ (except 220, 332); ECON; FS HN 342; INTST 235; LING 219, 275, 471; POL S; PSYCH (except 131); SOC; WGS 201, 203, 301, 320, 327, 328, 346, 350, 385*

Causes and consequences of family stressors including physical, sexual, and emotional abuse; substance abuse; and mental and physical illness across the life span. Interplay between victims, offenders, and the treatment system.

**HD FS 369: Research Methods in Human Development and Family Studies**

(3-1) Cr. 3. F.S.

*Prereq: (HD FS 102 or PSYCH 230); Junior or Senior classification*

Understanding and evaluating research. Use of primary and secondary data to identify and study problems related to human development and family issues. An introduction to statistical concepts and data analysis. Computer laboratory experience.

**HD FS 373: Death as a Part of Living**

(Cross-listed with GERON). (3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: HD FS 102*

Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes.

**HD FS 377: Aging and the Family**

(Cross-listed with GERON). (3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

Interchanges of older adults and their families. Emphasis on role changes, social interaction, and independence as influenced by health, finances, life styles, and community support.

**HD FS 378: Retirement Planning and Employee Benefits**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits.

**HD FS 378H: Retirement Planning and Employee Benefits: Honors**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits. Additional work required to meet Honors requirements.

**HD FS 383: Fundamentals of Financial Planning**

(3-0) Cr. 3. S.

*Prereq: HD FS 283*

Fundamental principles of the financial planning process, client/planner interactions, time value of money applications as well as analyses of ethics review, financial statements, cash flow and debt management, education planning, retirement planning, tax planning, and estate planning needs of families.

**HD FS 384: Family Insurance Planning**

Cr. 3. S.

*Prereq: HD FS 283*

Strategies for managing family financial risk with insurance. Emphasis on communication and planning process and the use of risk mitigation and insurance within families. Risk analysis and management within the comprehensive family financial planning process.

**HD FS 387: Applying Evidence-Based Practices in Human Services**

(3-0) Cr. 3. F.S.

*Prereq: Junior or Senior classification*

Practicing skills required to work with individuals and families in assessment, engagement, and intervention. Applying strategies including motivational interviewing and trauma informed care. Meets U.S. Diversity Requirement

**HD FS 395: Children, Families, and Public Policy**

(3-0) Cr. 3. F.S.Alt. SS., offered odd-numbered years.

*Prereq: HD FS 369 or Permission of Instructor*

Public policy and public service programs as they affect children and families. Examination of how individuals and groups influence policy. Investigation of current issues and programs influencing the well-being and welfare of children and families.

**HD FS 416: Human Development and Family Studies Seminar**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 8 credits in HD FS*

Intensive study of a selected topic in human development and family studies.



**HD FS 417: Supervised Student Teaching**

Cr. 8. Repeatable.

*Prereq: Permission of Instructor*

**HD FS 417C: Supervised Student Teaching: Early Childhood Special Education Programs.**

Cr. 8. Repeatable. F.S.

*Prereq: HD FS 455; HD FS 456; minimum 2.5 cumulative GPA; admission to Educator Preparation program*

Teaching experience with preschool children with disabilities.

**HD FS 418: Professional Practice Reflection/Discussion**

Cr. 0.5-2. Repeatable. F.S.

Discussion of professional practice experience.

**HD FS 418A: Professional Practice Reflection/Discussion: Teaching (0.5-0) Cr. 0.5. F.S.**

*Prereq: Concurrent enrollment in HD FS 417*

Discussion of HD FS 417 student teaching field experience. Offered on a satisfactory-fail basis only.

**HD FS 418B: Professional Practice Reflection/Discussion: Internships (2-0) Cr. 2. F.S.**

*Prereq: HD FS 218; Junior or Senior classification*

Process and development of skills necessary for professional preparation and practice including career planning, resume writing, and interviewing. Strategies for successful career management. Offered on a satisfactory-fail basis only.

**HD FS 449: Program Evaluation and Proposal Writing**

(3-0) Cr. 3. F.S.

*Prereq: Junior or Senior classification*

Theory and practice of program evaluation and proposal writing in human services including needs assessment, outcome development and measurement, and proposal components. Assessment of programs' success in meeting goals.

**HD FS 455: Curriculum and Interventions: Ages 3 through 6 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 343; HD FS 345; SP ED 405; SP ED 458*

Program models and methods leading to development and organization of appropriate curricula in preschool and kindergarten programs for young children with diverse learning needs. Government regulations and professional standards for child programming. Teaming with parents, colleagues, and paraprofessionals to plan, implement, and evaluate developmentally and culturally appropriate individualized education plans in inclusive settings. Practicum.

**HD FS 456: Working with Families in Early Intervention**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 340 or HD FS 344 or Permission of Instructor*

Applying family systems theory and family centered principles in early intervention. Understanding the impact of disability on families and young children. Utilizing strategies for delivering family-centered interventions and service coordination in home-based and natural environments. Building trusting relationships, teaming with families and interdisciplinary colleagues to create, implement, and evaluate Individualized Family Service Plans (IFSPs) for children birth to age three. Understanding foundations of theory and policy and empowering families through effective supports and services. Experiences with families.

**HD FS 479: Family Dynamics Through a Social and Cultural Lens**

(3-0) Cr. 3. F.S.

*Prereq: (HD FS 102 or PSYCH 230); (HD FS 369 or Permission of Instructor); Junior or Senior classification*

Exploration of social and cultural factors that influence family dynamics. Outcomes for families examined through a social justice lens. Students will examine how their social and cultural contexts impact their work within their chosen careers.

**HD FS 482: Family Savings and Investments**

(3-0) Cr. 3. F.

*Prereq: ECON 101; HD FS 383; STAT 101*

Management of family financial resources; emphasis on savings and the investment planning process; issues facing financial planners who manage family assets. Identification of investment options including common stocks, fixed income securities, convertible securities, and related choices.

**HD FS 484: Estate Planning for Families**

(3-0) Cr. 3. S.

*Prereq: HD FS 283*

Study of estate planning focusing on efficient conservation and transfer of wealth, consistent with client's goals. Legal, tax, financial and non-financial aspects of estate planning process; trusts, wills, probate, advanced directives, charitable giving, wealth transfers and related taxes.

**HD FS 485: Capstone: Family Financial Planning**

(3-0) Cr. 3. S.

*Prereq: (FIN 361 or HD FS 384); HD FS 341; HD FS 378; HD FS 383; HD FS 482*

Development and refinement of competencies required by personal financial planners to work with individuals and families in meeting financial objectives. Utilization of skills obtained in financial planning emphasis to complete one or more financial planning narratives.



**HD FS 486: Administration of Human Services Programs**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 369; 3 additional credits in HD FS at 300 level or above; Junior or Senior classification*

Examination of purpose, policies, staffing, operations, and clientele of organizations serving children, adults and families with diverse needs. Management/leadership principles and techniques. Introduction to financial management. Administrators/supervisors roles in employee management as well as development of client-oriented programs, fundraising, goal setting, strategic planning, and advocacy.

**HD FS 489: Financial Counseling**

(Dual-listed with HD FS 589). (2-0) Cr. 2. F.

*Prereq: HD FS 489: HD FS 283, HD FS 589: Graduate classification*

Personal, social/psychological and legal climates affecting family financial decisions. A life cycle approach to financial decision making. Development of financial counseling and planning skills to assist families and individuals to become self-sufficient in family financial management.

**HD FS 489L: Financial Counseling Laboratory**

(Dual-listed with HD FS 589L). (0-2) Cr. 1. Repeatable, maximum of 2 credits. F.

*Prereq: HD FS 489L: HD FS 283, HD FS 589: Graduate classification*

Hands-on financial counseling experience using preventative, remedial, and productive strategies in one-on-one and/or group situations. Students work with clients to develop diverse and inclusive decision-making and problem-solving methods to achieve goals or to remove barriers.

**HD FS 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*

Consult department office for procedure.

**HD FS 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*

Consult department office for procedure.

**HD FS 490I: Independent Study: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*

Consult department office for procedure.

**HD FS 491: Internship**

Cr. 4-9. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: HD FS 418B; Senior classification; minimum 2.0 cumulative GPA;*

*Department Permission*

Supervised work experience related to the student's curriculum. Offered on a satisfactory-fail basis only.

**HD FS 493: Workshop**

(Dual-listed with HD FS 593). Cr. arr. Repeatable. F.S.SS.

*Prereq: Senior classification*

Workshop in HD FS.

**HD FS 499: Research**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Supervised research experience.

**Courses primarily for graduate students, open to qualified undergraduates:**

**HD FS 501: Graduate Studies, Research, and Ethics in HD FS**

(2-0) Cr. 2. F.

*Prereq: Admission to HD FS Graduate program*

Overview of graduate study, research, ethics, and professional development in the field of human development and family studies. Curriculum, programs of study, portfolios, faculty research interests, dissemination of research, career planning, and teaching discussed.

**HD FS 502: Professional Development in Human Development and Family Studies**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: graduate classification; HD FS 501*

Overview of professional skills, portfolio building, preparation for academic and nonacademic jobs, leadership fundamentals and project management training, time management, work balance issues, and professional ethics. Opportunities for graduate students to work on their professional development tailored to individual needs of students. Develop an individual professional portfolio.

**HD FS 503: Introduction to Research Design**

(4-0) Cr. 4. F.

*Prereq: Permission of instructor*

Basic research skills including developing research questions, posing testable hypotheses, determining appropriate data collection and analyses, and identifying the benefits and limitations of various sampling strategies. Measurement theory, observational assessments, survey research, experimental and quasi-experimental designs, analysis of secondary data, and qualitative research methods.

**HD FS 504: Qualitative Research Methods**

(3-0) Cr. 3. S.

*Prereq: 9 credits of social sciences or permission of instructor*

Introduction to qualitative research methodology. Application of fieldwork methods, analysis, interpretation, and writing through individual qualitative research projects.

**HD FS 505: Application of Quantitative Research Methods**

(3-0) Cr. 3. S.

*Prereq: HD FS 503 or permission of instructor*

Descriptive and inferential statistics, hypothesis testing, scales of measurement, comparisons of proportions, correlations between variables, the t distribution, analysis of variance, and multiple regression.

**HD FS 510: Theories of Human Development**

(3-0) Cr. 3. F.SS.

*Prereq: 9 credits of social sciences or permission of instructor*

Theoretical approaches and current research in child, adolescent, and adult development. Individual life span perspectives. Implications for research, policy and practice. (Summer course offering is on-line).

**HD FS 511: Family Theory**

(3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theoretical approaches and current research in family development. Review the nature and value of theory to the study of the family and evaluate the use of theory in empirical research. Implications for research, policy and practice.

**HD FS 530: Perspectives in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. F.

Overview of current aging issues including theory and research, critical social and political issues in aging, the interdisciplinary focus of gerontology, career opportunities, and aging in the future.

**HD FS 534: Adult Development**

(Cross-listed with GERON). (3-0) Cr. 3. S.

Exploration of the biological, psychological and social factors associated with aging. Although the focus is on the later years, information is presented from a life-span developmental framework. Empirical studies are reviewed and their strengths, limitations and implications for normative and optimal functioning are discussed.

**HD FS 538: Developmental Disabilities**

(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in human development and family studies or psychology or permission of instructor*

Theories, research, and current issues regarding the intersection of development and disabilities. Investigation of interventions with individuals and families. (on-line course offering via Distance Education).

**HD FS 541: Housing and Real Estate in Family Financial Planning**

(Cross-listed with FFP). (3-0) Cr. 3. Alt. SS., offered even-numbered years.

The role of housing and real estate in the family financial planning process, including taxation, mortgages, financial calculations, legal concerns, and ethical issues related to home ownership and real estate investments. Emphasis on emerging issues in the context of housing and real estate.

**HD FS 545: Economics, Public Policy, and Aging**

(Cross-listed with GERON). (3-0) Cr. 3. F.

Policy development in the context of the economic status of the older adult population. Retirement planning and the retirement decisions; social security and public transfer programs; intra-family transfers to/from the aged; private pensions; financing medical care; prospects and issues for the future.

**HD FS 555: Current Issues and Research in Early Childhood Services**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Analysis of contemporary and historical early childhood/early intervention/early childhood special education model programs and services. Examination of relationships among service systems and implementation, program quality, teacher effectiveness, and outcomes for children with and without disabilities. (on-line course offering via Distance Education).

**HD FS 563: Environments for the Aging**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: HD FS 360 or 3 credits in housing, architecture, interior design, rehabilitation, psychology, or human development and family studies or permission of instructor*

Emphasis on independent living within residential settings including specialized shelter, supportive services and housing management. Application of criteria appropriate for accessibility and functional performance of activities; universal design principles. Creative project provides service learning opportunities. Meets U.S. Diversity Requirement

**HD FS 566: Family Policy**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 6 credits in social sciences or permission of instructor*

An introduction to policy for family researchers and practitioners. Examination of relevant policies through a family lens via discussion of theory and student interests in current and enduring family policies and programs. Descriptions of work roles in family policy and the interaction of family researchers and policymakers.

**HD FS 567: Family Stress, Abuse, and Illness**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Explores research related to family stress within romantic, parent-child, and sibling relationships. Examines contemporary theory and research on the nature, causes, and consequences of family stressors. These stressors include, but are not limited to economic distress; physical and emotional abuse; substance abuse; and mental and physical illness across the life span. (on-line course offering via Distance Education).

**HD FS 568: Individual and Family Assessment**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Use of interviews, observational assessments, direct tests with individuals and families for research and intervention. Opportunities to practice assessments.

**HD FS 575: Cross-cultural Perspectives about Families and Children**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in social sciences or permission of instructor*

Review of current research regarding family diversity including an examination of cultural and structural influences on the development and well-being of families and children. Discussion of the impact on human rights and social justice. (on-line course offering via Distance Education).

**HD FS 577: Aging in the Family Setting**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theories and research related to personal and family adjustments in later life affecting older persons and their intergenerational relationships. Related issues including demographics also are examined through the use of current literature.

**HD FS 579: Family Well-being Across the Lifespan**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Review of current research to provide a theoretical and practical understanding of the economic, social, and psychological factors that influence interpersonal relationships and individual well-being within the institution of the family system. Economic and policy effects considered. (on-line course offering via Distance Education).

**HD FS 581: International Study in Human Development and Family Studies**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581A: International Study in HD FS: Practicum**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581B: International Study in HD FS: Exchange**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581C: International Study in HD FS: Group Study**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 583: Investing for the Family's Future**

(Cross-listed with FFP). (3-0) Cr. 3. F.

Evaluation of investment markets for the household. Analysis of how families choose where to put their savings. Emphasis is on using the family's overall financial and economic goals to help inform investment choices.

**HD FS 584: Program Evaluation and Research Methods in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. S.

Overview of program evaluation, research methods, and grant writing in gerontology. Includes application of quantitative and qualitative methods in professional settings.

**HD FS 585: Program Evaluation**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 6 credits in graduate level social sciences or permission of instructor*

Theoretical and practical issues related to design and implementation of program evaluation in social sciences. Includes theory, design, implementation, analysis and proposal writing to assist programs to be successful in meeting program goals.

**HD FS 588: Family, Income, and the Economy**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Analysis of family income, wealth, and economic well-being. Emphasis on effects of family behavior and public policies on the adequacy and security of income across the family life cycle. Implications of resource allocation within the family for adult and child well-being.

**HD FS 589: Financial Counseling**

(Dual-listed with HD FS 489). (2-0) Cr. 2. F.

*Prereq: HD FS 489: HD FS 283, HD FS 589: Graduate classification*

Personal, social/psychological and legal climates affecting family financial decisions. A life cycle approach to financial decision making. Development of financial counseling and planning skills to assist families and individuals to become self-sufficient in family financial management.

**HD FS 589L: Financial Counseling Laboratory**

(Dual-listed with HD FS 489L). (0-2) Cr. 1. Repeatable, maximum of 2 credits. F.

*Prereq: HD FS 489L: HD FS 283, HD FS 589: Graduate classification*

Hands-on financial counseling experience using preventative, remedial, and productive strategies in one-on-one and/or group situations. Students work with clients to develop diverse and inclusive decision-making and problem-solving methods to achieve goals or to remove barriers.

**HD FS 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Consult department office on procedure for filing a written plan of study.

**HD FS 590I: Special Topics: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Consult department office on procedure for filing a written plan of study.

**HD FS 590R: Special Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Consult department office on procedure for filing a written plan of study.

**HD FS 591: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 10 graduate credits*

Supervised experience in an area of human development and family studies.

**HD FS 591I: Internship: Human Development and Family Studies**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 10 graduate credits*

Supervised experience in an area of human development and family studies.

**HD FS 593: Workshop**

(Dual-listed with HD FS 493). Cr. arr. Repeatable. F.S.SS.

*Prereq: Senior classification*

Workshop in HD FS.

**HD FS 594: Professional Seminar in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. SS.

An integrative experience for gerontology students designed to be taken near the end of the degree program. By applying knowledge gained in earlier coursework, students will strengthen skills in ethical decision-making behavior, applying these skills in gerontology-related areas such as advocacy, professionalism, family and workplace issues. Students from a variety of professions will bring their unique perspectives to bear on topics of common interest.

**HD FS 599: Creative Component**

Cr. arr. F.S.SS.

*Prereq: 9 graduate credits in HD FS*

Nonthesis creative component (e.g., a special report, capstone course, integrated field experience, annotated bibliography, research project, design, or other creative endeavor).

**Courses for graduate students:****HD FS 603: Advanced Quantitative Methods**

(3-0) Cr. 3. F.

*Prereq: HD FS 503, HD FS 505; STAT 402 or STAT 404 or permission of instructor*

Methodological and analytical issues in research in human development and family studies. Advanced research design and measurement, selection of statistical techniques, and issues in the interpretation of findings.

**HD FS 604: Advanced Qualitative Methods**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 504 or permission of instructor*

Research methodologies including phenomenology, grounded theory, ethnography, and case studies. Methods of data collection and analysis procedures. Issues of ethics and interpretation of findings. (on-line course offering via Distance Education).

**HD FS 605: Multi-level Modeling**

(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 503 and HD FS 505 or STAT 404 or permission of instructor*

Rationale for and interpretation of random coefficient models. Strategies for the analysis of multi-level and panel data including models for random intercepts, random slopes, and growth curves.

**HD FS 606: Advanced Structural Equation and Longitudinal Modeling**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 603 or STAT 404 or permission of instructor*

Rationale for and interpretation of advanced structural equation modeling for the analysis of longitudinal data. Emphasis will be placed on developing a working familiarity with some of the common statistical procedures, coupled with their application through the use of statistical software.

**HD FS 607: Mixed Methods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 503, HD FS 504, HD FS 505, or permission of instructor*

Foundations of mixed methods research, controversies, and philosophical concerns. Rationale for and interpretation of mixed methods designs. Research design, sampling, data collection, data analysis, results, and interpretation. (on-line course offering via Distance Education).

**HD FS 608: Grant Writing for Research**

(3-0) Cr. 3. F.

*Prereq: HD FS 503, HD FS 505, and HD FS 504 or permission of instructor*

Understand how to identify funding sources as well as the fundamental components of a federal research grant proposal such as the abstract or summary, background and significance, specific aims/goals and objectives, project design and methods, sustainability, assessment, broader impacts, dissemination, budget, budget justification, and cover letter.

**HD FS 616: Seminar**

Cr. arr.

May be repeated. F.S.SS.

**HD FS 631: Child Health and Development**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Young children's cognitive, physical, communication, and social-emotional health and development will be examined. Both typical and atypical trajectories will be explored. Research on current trends in the field will be emphasized. (on-line course offering via Distance Education).

**HD FS 632: Behavioral Interventions in Early Childhood**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Issues related to behavioral development and needs of children ages 3-8. Design and implementation of group and individual behavioral interventions. Discussion of coaching strategies to improve intervention implementation. (on-line course offering via Distance Education).

**HD FS 633: Infant Mental Health**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Examination of the individual, interpersonal, and familial factors that influence infant (birth through age 3) mental health. Analysis of the risk and protective factors that influence these systems and their potential effects on social-emotional development. Current issues relating to effective programs for improving parent-infant interactions and additional supports available to families. (on-line course offering via Distance Education).

**HD FS 634: Adolescent and Emerging Adult Health and Development**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Theory and research on biopsychosocial, cognitive, physical and sexual health and development from early adolescence to emerging adulthood. Contexts of development including families, peers, schools, neighborhoods, romantic relationships, economics and public policies are considered. (on-line course offering via Distance Education).

**HD FS 635: Adult Development, Aging, and Health**

(Cross-listed with GERON). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Review of the impact of the growing older adult population as well as individual development and aging on individuals, families, and society. Exploration of theoretical perspectives applied to adult development and aging and distinction of normative and non-normative changes in adulthood. Discussion of methods to assess development across adulthood and consideration of the role of individual and environmental factors impacting efforts to optimize adult development.

**HD FS 640: Biomarkers and Family Research**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor.*

Research on the biological underpinnings of human development and the biobehavioral health of the family. Exposure to interdisciplinary research and practice on biomarkers in the family, with particular emphasis on health-and well being-related measures. Application of biomarker collection, measurement, analysis and dissemination.

**HD FS 690: Advanced Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor and enrollment in Ph.D. program*

**HD FS 690I: Advanced Topics: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq: Permission of instructor and enrollment in Ph.D. program*



**HD FS 691: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in the following specified areas.

Offered on a satisfactory-fail basis only.

**HD FS 691A: Internship: College Teaching**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in college-level teaching. Offered on a satisfactory-fail basis only.

**HD FS 691B: Internship: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in conducting research. Offered on a satisfactory-fail basis only.

**HD FS 691D: Internship: Professional Experience**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in relevant professional experiences. Offered on a satisfactory-fail basis only.

**HD FS 699: Research**

Cr. arr. Repeatable.

Thesis and dissertation research. Offered on a satisfactory-fail basis only.

**HD FS 699I: Research: Human Development and Family Studies**

Cr. arr. Repeatable.

Thesis and dissertation research. Offered on a satisfactory-fail basis only.

## Kinesiology

### Mission

We promote health and well-being by creating and disseminating knowledge about physical activity and active living. Through discovery, learning and engagement we improve the lives of citizens of Iowa, the United States and the world.

### Goals

The department has identified the following goals to support this mission:

1. We seek to improve the lives of citizens of Iowa, the United States, and the world by the creation and dissemination of knowledge about physical activity and its relationship to health and well-being.
2. We prepare scholars and professionals in the study of physical activity at the undergraduate and graduate levels.

3. We educate the public and the University community in the scientific aspects of physical activity especially exercise, sport, and the role of movement throughout the lifespan.

## UNDERGRADUATE STUDY

The Department of Kinesiology offers a Bachelor of Science degree in Kinesiology & Health. The undergraduate curriculum major/option is comprised of three components: general education, required departmental courses and the major/option courses. The intent of the general education component is to promote intellectual and personal growth and to prepare students for success in the basic, advanced and major/option components. Required courses provide an introduction to the field and fundamental principles of physical activity, fitness, health and disease.

### B.S. degree in Kinesiology & Health

The Kinesiology & Health major includes five specialization options. Options comprise a focused area of study within Kinesiology and Health. Coursework within each specialization option builds upon personal and scholarly learning by enabling students to master content and skills specific to career applications. Options available are:

1. Community and Public Health
2. Exercise Science
3. Physical Activity and Health Promotion
4. Physical Education Teacher Education
5. Pre-Health Professions

#### Academic options within the Kinesiology & Health major

Students in the **Community and Public Health** option are prepared for professional employment at local, state or national health agencies, medical centers, and other public or private organizations that seek to promote health in the population.

Students in the **Exercise Science** option are prepared for professional roles as health and fitness leaders or program managers. Employment opportunities include work in corporate fitness programs, health/fitness facilities, clinics, or hospitals. Graduates are able to plan, implement and supervise exercise programs which will improve fitness and health. Graduates also have a basic understanding of management issues related to business applications in the health and fitness field.

Students in the **Physical Activity and Health Promotion** option are prepared for careers focused on health and physical activity. This option provides more emphasis on behavioral and psychological aspects of physical activity. Students are prepared for careers in community based settings, including work sites, schools, hospitals, and other community agencies.

Students in the **Physical Education/Teacher Education** option are prepared to teach physical education in grades K-12 and to meet the



State of Iowa learning outcomes for teachers. Graduates can plan developmentally appropriate physical education, and individualize instruction and assessment for diverse audiences.

Students in the **Pre-Health Professions** option utilize an interdisciplinary approach to the study of human movement. In so doing, they become prepared for graduate study in Kinesiology or advanced study leading to careers in human medicine, physical therapy, physician assistant or other healthcare professions.

## Student Learning Outcomes for the Undergraduate Degree

Despite the diversity of options, the learning outcomes comprise a common framework for each student as they progress through Iowa State University.

The learning outcomes emphasized in academic coursework in the Department of Kinesiology are:

### COMMUNICATION

Uses clear and effective written, oral, visual, and electronic (WOVE) communication techniques to foster inquiry, collaboration, and engagement in physical activity and health related settings.

### LIFELONG LEARNING, ASSESSMENT, AND SELF-REFLECTION

Analyzes and evaluates one's own knowledge, abilities and actions relative to professional standards, seeks opportunities to grow professionally, and utilizes self-assessment and assessment of others to foster physical, cognitive, social, and emotional well-being.

### CONTENT KNOWLEDGE, DISCOVERY, AND CRITICAL THINKING

Understands fundamental concepts of physical activity and health, conducts scientific inquiry, and applies critical thinking to solve problems from personal, scholarly, and professional perspectives.

### ETHICS, DIVERSITY, AND SOCIAL JUSTICE

Demonstrates leadership and social responsibility to improve quality of life for others and ensures equitable access for diverse groups by creating appropriate environments to initiate and maintain a physically active, healthy lifestyle.

## Other Program Offerings:

### ENDORSEMENT TO COACH INTERSCHOLASTIC ATHLETICS

The State Department of Education has provided for the endorsement of licensed teachers for the coaching of athletic teams in schools. The endorsement does not lead to licensure to teach physical education. For requirements of the program, leading to the coaching endorsement, see School of Education, Teacher Education. More information can be found at: <http://www.kin.hs.iastate.edu/>

### ENDORSEMENT TO TEACH HEALTH EDUCATION

Those interested in teaching health education in the public schools may get a primary licensure or an additional endorsement. The State

Department of Education has approved the Health Teaching Licensure for grades 5-12.

### BASIC ACTIVITY INSTRUCTION PROGRAM

The department offers a wide selection of beginning, intermediate, and advanced courses in the areas of aquatics, dance, fitness, martial arts, and sports. These courses are designed to serve general education purposes for all students.

### DANCE

Coursework in dance provides opportunities for students to develop an understanding and appreciation of dance as part of a liberal education. Those interested in teaching dance and physical education in the public schools may major in Kinesiology and Health (Physical Education Teacher Education) and minor in Dance.

An interdisciplinary Performing Arts major with a Dance emphasis is available through the College of Liberal Arts and Sciences. For further information see Index: Performing Arts to find Performing Arts Major, Emphasis in Dance.

## Curriculum in Athletic Training

The athletic training major prepares students for a career as an athletic trainer in high school, college or professional settings or for work in other settings (such as sports medicine clinics, the military, industry, and fitness centers). Program details including course requirements, admission procedures and technical standards can be found at <http://www.kin.hs.iastate.edu/programs/athletic-training/#program-information-and-requirements>.

## Curriculum in Kinesiology and Health

The curriculum in Kinesiology and Health is designed for students preparing to enter professional areas related to the medical, health, physical activity, exercise or sport science fields. Students majoring in Kinesiology & Health may select one of five options:

1. Community and Public Health
2. Exercise Science
3. Physical Activity and Health Promotion
4. Physical Education Teacher Education
5. Pre-Health Professions

Minors in dance, exercise science, health promotion, and kinesiology, are available; see requirements under Kinesiology, Undergraduate Programs.

A major in Performing Arts with a dance emphasis is available; see requirements under Curriculum in Performing Arts Program, Dance.

### Communication Proficiency

In order to meet graduation requirements, all students must earn an average of C (2.0) or better in ENGL 150 and ENGL 250, with the ENGL

150 grade being no lower than a C- and the ENGL 250 grade no lower than a C. Students not meeting this condition must earn a C or better in an advanced writing course:

ENGL 302	Business Communication	3
or ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3

## U.S. Diversity and International Perspectives

In order to meet graduation requirements, all students must complete 3 cr. of course work in U.S. Diversity and 3 cr. in International Perspectives.

KIN 360 meets the U.S. Diversity requirement and Dance 270 meets the International Perspectives requirement. See university approved list for other courses.

## General Education:

### Physical and Life Sciences:

BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
BIOL 256	Fundamentals of Human Physiology	3
BIOL 256L	Fundamentals of Human Physiology Laboratory	1

### Additional option-specific requirements are: Community and Public Health

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
FS HN 167	Introductory Human Nutrition and Health	3
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1

### Exercise Science

FS HN 167	Introductory Human Nutrition and Health	3
PHYS 115	Physics for the Life Sciences	4

### Physical Activity and Health Promotion

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
CHEM 163	College Chemistry	4
CHEM 163L	Laboratory in College Chemistry	1
FS HN 167	Introductory Human Nutrition and Health	3
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1

### Physical Education Teacher Education

PHYS 115	Physics for the Life Sciences	4
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### Pre-Health Professions

PHYS 131	General Physics I	4-5
& 131L	and General Physics I Laboratory	
or PHYS 115	Physics for the Life Sciences	

### Mathematics and Statistics: Community and Public Health

From the following: 3-4

STAT 101	Principles of Statistics
or STAT 104	Introduction to Statistics

### Exercise Science

From the following: 3-4

MATH 140	College Algebra
or MATH 141	Preparation for Calculus
or MATH 142	Applied Trigonometry
or MATH 161	Calculus I

From the following: 3-4

STAT 101	Principles of Statistics
or STAT 104	Introduction to Statistics

### Physical Activity and Health Promotion

One of the following: 3-4

STAT 101	Principles of Statistics
or STAT 104	Introduction to Statistics

### Physical Education Teacher Education

One of the following: 3-4

MATH 104	Introduction to Probability
or MATH 141	College Algebra
or STAT 101	Principles of Statistics
or STAT 104	Introduction to Statistics

### Pre-Health Professions

One of the following: 3-4

MATH 140	College Algebra
or MATH 141	Preparation for Calculus
or MATH 142	Applied Trigonometry
or MATH 161	Calculus I

From the following: 3-4

STAT 101	Principles of Statistics
or STAT 104	Introduction to Statistics

### Social Sciences: 9 cr. min required

#### Option-specific requirements are:

#### Community and Public Health

PSYCH 101	Introduction to Psychology	3
PSYCH 230	Developmental Psychology	3
SOC 134	Introduction to Sociology	3

**Exercise Science**

PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3

**Physical Activity and Health Promotion**

PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3

**Physical Education Teacher Education**

PSYCH 230	Developmental Psychology	3
SOC 134	Introduction to Sociology	3

**Pre-Health Professions**

PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3

**Humanities: 6 cr. min required**

Choose from department approved list.

**Communications: 13 cr. min required**

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
One of the following		3
ENGL 302	Business Communication	
or ENGL 314	Technical Communication	
or SP CM 31	Business and Professional Speaking	

**Program requirements:**

The following courses are required in all majors and options:

H S 110	Personal and Consumer Health	3
H S 350	Human Diseases (*)	3
KIN 252	Introduction to the Discipline of Kinesiology	1
KIN 253	Orientation and Learning Community in Kinesiology and Health	1
KIN 258	Principles of Physical Fitness and Conditioning	2
KIN 358	Exercise Physiology (*)	3
KIN 359	Exercise Physiology Lab (*)	1

\* A grade of C- or better is required.

Total cr. required to graduate: A minimum of 124 credits is required, with a minimum of 46 credits in courses numbered 300 or above.

**Courses for Kinesiology and Health Major**  
**Option 1. Community and Public Health**

This option prepares students for a diverse array of careers in public and private health agencies as well as local, state and federal government programs. Students are qualified for careers in a variety of health and human service agencies, community organizations, and hospitals. This option also provides the ideal background training for credentials as a Certified Health Education Specialist (CHES).

Option Requirements:

P R 220	Principles of Public Relations	3
or P R 305	Publicity Methods	
H S 105	First Aid and Emergency Care	2
H S 285	Pre-Internship in Kinesiology and Health	1-2
KIN 360	Sociology of Physical Activity and Health (*)	3
H S 310	Community and Public Health (*)	3
H S 385	Preparation and Search Strategies for Kinesiology and Health Internships	0.5
H S 430	Community Health Program Development	3
H S 464	Physical Activity Epidemiology	3
or VDPAM 428	Principles of Epidemiology and Population Health	
H S 485A	Internship in Health Studies: Community and Public Health	8-12
HD FS 270	Family Communications and Relationships	3
HD FS 449	Program Evaluation and Proposal Writing	3
or ENGL 309	Proposal and Report Writing	
PSYCH 485	Health Psychology	3
One of the following		
HD FS 377	Aging and the Family	3
or HD FS 395	Children, Families, and Public Policy	
Electives: 8-12 credits		

\* A grade of C- or better is required.

**Option 2. Exercise Science**

This option prepares students for careers in exercise/fitness promotion. Students are prepared as health/fitness specialists, personal trainers, strength and conditioning specialists, and health coaches. Students find work in fitness centers, worksite health programs, medical facilities, cardiac rehabilitation centers, and other agencies that provide fitness services. Students are eligible to sit for certification exams offered by the American College of Sports Medicine and the National Strength & Conditioning Association.

Option Requirements:

KIN 259	Leadership Techniques for Fitness Programs	3
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KIN 266	Advanced Strength Training and Conditioning	2
KIN 285	Pre-Internship in Kinesiology and Health	1-2
KIN 345	Management of Health-Fitness Programs and Facilities	3
KIN 355	Biomechanics (*)	3
KIN 366	Exercise Psychology (*)	3
KIN 372	Motor Control and Learning Across the Lifespan (*)	3
KIN 373	Biomechanics and Motor Control Laboratory	1
KIN 385	Preparation and Search Strategies for Kinesiology and Health Internships	0.5
KIN 458	Principles of Fitness Assessment and Exercise Prescription (*)	4
KIN 459	Internship in Exercise Leadership	1
KIN 462	Medical Aspects of Exercise	3
KIN 480	Functional Anatomy	3
KIN 485A	Internship in Exercise Science	8-12
H S 380	Worksite Health Promotion	3
A TR 220 or H S 305	Basic Athletic Training Instructor's First Aid and Cardiopulmonary Resuscitation	2
Electives: 12-16 credits		

\* A grade of C- or better is required.

### Option 3. Physical Activity and Health Promotion

This option prepares students for a variety of career outlets focused on health and physical activity promotion. The coursework provides the ideal background for students interested in worksite wellness programming. Students are also well suited to pursue career opportunities in health coaching and health promotion in schools, community agencies, as well as clinical settings. This option provides ideal background training for students interested in pursuing the Physical Activity in Public Health Specialist Certification offered by the American College of Sports Medicine.

Option Requirements:

FS HN 365	Obesity and Health	3
H S 285	Pre-Internship in Kinesiology and Health	1-2
H S 310	Community and Public Health (*)	3
H S 380	Worksite Health Promotion	3
H S 385	Preparation and Search Strategies for Kinesiology and Health Internships	0.5
H S 430	Community Health Program Development	3
H S 464	Physical Activity Epidemiology	3

H S 485B	Internship in Health Studies: Physical Activity and 8-12 Health Promotion	
KIN 259	Leadership Techniques for Fitness Programs	3
KIN 360	Sociology of Physical Activity and Health (*)	3
KIN 366	Exercise Psychology (*)	3
KIN 458	Principles of Fitness Assessment and Exercise Prescription (*)	4
KIN 467	Exercise and Health: Behavior Change	3

Electives: 15-19 credits

\* A grade of C- or better is required.

### Option 4. Physical Education Teacher Education

This option is for students seeking a license to teach K-12 physical education. All courses required for licensure have a minimum grade requirement of a C or C-. Students interested in a coaching and/or a health endorsement must complete additional coursework.

Option Requirements:

KIN 231	Fundamentals of Tumbling and Gymnastics (*)	1
KIN 232	Fundamentals of Team Sports (*)	1
KIN 236	Fundamentals of Individual Sports and Fitness (*)	1
KIN 259	Leadership Techniques for Fitness Programs	3
KIN 280	Directed Field Experience in Elementary Physical Education	1
KIN 281	Directed Field Experience in Secondary Physical Education	1
KIN 282	Field Experience with Educational Outreach	1
KIN 312	Movement Education in Elementary School Physical Education (**)	3
KIN 313	Teaching Secondary Physical Education (**)	3
KIN 355	Biomechanics (*)	3
KIN 365 or KIN 366	Sport Psychology (*) Exercise Psychology	3
KIN 372	Motor Control and Learning Across the Lifespan (*)	3
KIN 395	Adapted Physical Education (**)	3
KIN 417	Supervised Teaching in Physical Education in the Secondary School (**)	8
KIN 418	Supervised Teaching in Physical Education in the Elementary School (**)	8
KIN 471	Measurement in Physical Education (**)	3
KIN 475	Physical Education Curriculum Design and Program Organization (**)	3
DANCE 211	Fundamentals and Methods of Social and World Dance (*)	1

EDUC 204	Social Foundations of Education in the United States: Secondary	3
EDUC 406	Social Justice Education and Teaching: Secondary	3
H S 105	First Aid and Emergency Care (*)	2
H S 305	Instructor's First Aid and Cardiopulmonary Resuscitation (*)	2
Electives: 5 credits		

\* A grade of C- or better is required.

\*\* A grade of C or better is required.

## Option 5. Pre-Health Professions

This option is for students interested in graduate study or for those who are preparing for professional programs in medicine, physical therapy, physician assistant, and other healthcare professions. Course work provides background in human movement while completing the requirements for entry into graduate or professional school.

Option Requirements:

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
KIN 242	Planning for Success in a Health Career	0.5
KIN 355	Biomechanics (*)	3
KIN 365	Sport Psychology (*)	3
or KIN 366	Exercise Psychology (*)	
KIN 372	Motor Control and Learning Across the Lifespan (*)	3
KIN 373	Biomechanics and Motor Control Laboratory	1
9 cr. from the following		9
H S 464	Physical Activity Epidemiology	3
KIN 455	Research Topics in Biomechanics	3
KIN 458	Principles of Fitness Assessment and Exercise Prescription	4
KIN 462	Medical Aspects of Exercise	3
KIN 466	Exercise for Mental Health	3
KIN 467	Exercise and Health: Behavior Change	3
KIN 472	Neural Basis of Human Movement	3
KIN 473	Physical Dimensions of Aging	3
KIN 480	Functional Anatomy	3

Specialization Requirements: Other prerequisites as required by professional schools.

Electives: 6-14 credits

\* A grade of C- or better is required.

## FOUR YEAR PLANS

Students must complete a 3-credit course in US diversity and a 3-credit course in international perspectives. Check the ISU homepage for a list of approved courses. You must complete a minimum of 46 credits in 300/400 level courses and a total of 124 credits for graduation. Four year plans are arranged with courses in prerequisite sequence and within the term a course is usually offered. These are SAMPLE plans - use the degree audit as "official" documentation of progress toward your degree.

### Kinesiology and Health, B.S. - Community/Public Health

#### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 CHEM 163	4
BIOL 211L	1 CHEM 163L	1
ENGL 150	3 FS HN 167	3
H S 110	3 H S 105	2
KIN 252	1 KIN 258	2
KIN 253	1 PSYCH 230	3
LIB 160	1 Elective	1
PSYCH 101	3	
<b>16</b>		<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
ENGL 250	3 H S 285	1-2
HD FS 270	3 P R 220 or 305	3
SOC 134	3 SP CM 212	3
STAT 101 or 104	3-4 Elective	1
	Humanities Choice	3
<b>16-17</b>		<b>15-16</b>

#### Junior

Fall	Credits Spring	Credits
H S 310	3 H S 385	0.5
H S 350	3 HD FS 449 or ENGL 309	3
HD FS 377 or 395	3 KIN 360	3
KIN 358	3 MICRO 201	2
KIN 359	1 MICRO 201L	1
Elective	1 PSYCH 485	3
Humanities Choice	3 Electives	3
<b>17</b>		<b>15.5</b>

Senior			Senior		
Fall	Credits Spring	Credits	Fall	Credits Spring	Credits
ENGL 302, 314, or SP CM 312	3 H S 485A	8-12	ENGL 302, 314, or SP CM 312	3 KIN 485A	8-12
H S 430	3		KIN 373	1	
H S 464	3		KIN 458	4	
Electives	2		KIN 459	1	
Electives (300+ Level Courses)	6		KIN 462	3	
			KIN 480	3	
			Electives (300+ level course)	3	
	<b>17</b>	<b>8-12</b>		<b>18</b>	<b>8-12</b>

### Kinesiology and Health, B.S. - Exercise Science

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 FS HN 167	3
H S 110	3 KIN 258	2
KIN 252	1 MATH 140, 143, 145, or 165	3-4
KIN 253	1 SOC 134	3
LIB 160	1 SP CM 212	3
PSYCH 101 or 230	3 Electives	2
Humanities Choice	3	
	<b>15</b>	<b>16-17</b>

Sophomore		
Fall	Credits Spring	Credits
BIOL 255	3 A TR 220 or H S 305	2
BIOL 255L	1 BIOL 256	3
ENGL 250	3 BIOL 256L	1
KIN 259	3 KIN 266	2
KIN 285	1-2 STAT 101 or 104	3-4
Electives	2 Electives	3
Social Science Choice	3	
	<b>16-17</b>	<b>14-15</b>

Junior		
Fall	Credits Spring	Credits
H S 350	3 H S 380	3
KIN 345	3 KIN 355	3
KIN 358	3 KIN 372	3
KIN 359	1 KIN 385	0.5
KIN 366	3 Electives	5
PHYS 115	4 Humanities Choice	3
	<b>17</b>	<b>17.5</b>

### Kinesiology and Health, B.S. - Physical Activity and Health Promotion

Freshman		
Fall	Credits Spring	Credits
BIOL 211	3 CHEM 163	4
BIOL 211L	1 CHEM 163L	1
ENGL 150	3 FS HN 167	3
H S 110	3 KIN 258	2
KIN 252	1 SOC 134	3
KIN 253	1 Humanities Choice	3
LIB 160	1	
PSYCH 101 or 230	3	
	<b>16</b>	<b>16</b>

Sophomore		
Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
ENGL 250	3 SP CM 212	3
KIN 259	3 STAT 101 or 104	3-4
KIN 285	1-2 Electives	3
MICRO 201	2 Social Science Choice	3
MICRO 201L	1	
Elective	1	
	<b>15-16</b>	<b>16-17</b>

Junior		
Fall	Credits Spring	Credits
H S 310	3 FS HN 365	3
H S 350	3 H S 380	3
KIN 358	3 H S 385	0.5
KIN 359	1 H S 464	3
KIN 366	3 KIN 360	3



Elective	4 Humanities Choice	3
	<b>17</b>	<b>15.5</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 302, 314, or SP CM 312	3 H S 485B	8-12
H S 430	3	
KIN 458	4	
KIN 467	3	
Electives	3	
	<b>16</b>	<b>8-12</b>

## Kinesiology and Health, B.S. - Physical Education Teacher Education

**Freshman**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
EDUC 204	3 DANCE 211	1
ENGL 150	3 KIN 236	1
H S 110	3 KIN 258	2
KIN 252	1 KIN 280	1
KIN 253	1 MATH 104, 140, STAT 101, or STAT 104	3-4
LIB 160	1 SOC 134	3
PSYCH 230	3 Humanities (International Perspective)	3
	<b>15</b>	<b>14-15</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
ENGL 250	3 H S 305	2
H S 105	2 KIN 282	1
KIN 231	1 SP CM 212	3
KIN 232	1 Electives	3
KIN 259	3 Humanities (American History)	3
KIN 281	1	
	<b>15</b>	<b>16</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
KIN 312	3 ENGL 302, 314, or SP CM 312	3
KIN 372	3 H S 350	3
PHYS 115	4 KIN 313	3

Electives	3 KIN 358	3
Social Science Choice	3 KIN 359	1
	KIN 471	3

	<b>16</b>	<b>16</b>
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**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
EDUC 406	3 KIN 417	8
KIN 355	3 KIN 418	8
KIN 366 or 365	3	
KIN 395	3	
KIN 475	3	
Elective	1	
	<b>16</b>	<b>16</b>

## Kinesiology and Health, B.S. - Pre-Health Professions - Chiropractic

**Freshman**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 H S 110	3
KIN 252	1 MATH 140, 143, 145, or 165	3-4
KIN 253	1 Elective	1
LIB 160	1	
	<b>15</b>	<b>15-16</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
CHEM 331	3 BBMB 301 or CHEM 332 <i>and</i> CHEM 332L	3-4
CHEM 331L	1 SOC 134	3
ENGL 250	3 SP CM 212	3
KIN 242	0.5 Humanities Choice	3
KIN 258	2	
PSYCH 101 or 230	3	
	<b>16.5</b>	<b>16-17</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
KIN 366 or 365	3 H S 350	3
KIN 372	3 KIN 355	3

PHYS 131	4 PHIL 331	3	KIN 242	0.5 STAT 101 or 104	3-4
PHYS 131L	1 Electives (300+ Level Courses)	6	KIN 258	2	
			PSYCH 101 or 230	3	
STAT 101 or 104	3-4			<b>16.5</b>	<b>14-15</b>
Social Science Choice	3				

<b>17-18</b>		<b>15</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 302, 314, or SP CM 312	3 KIN 400 Level Courses *	9
FS HN 367	1 Electives	6
KIN 358	3	
KIN 359	1	
KIN 373	1	
Elective	1	
Electives (300+ Level Courses)	3	
Humanities Choice	3	
<b>16</b>		<b>15</b>

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Dentistry

### Freshman

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 H S 110	3
KIN 252	1 MATH 143, 145, or 165	3-4
KIN 253	1	
LIB 160	1	
<b>15</b>		<b>14-15</b>

### Sophomore

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
CHEM 331	3 CHEM 332	3
CHEM 331L	1 CHEM 332L	1
ENGL 250	3 SOC 134	3

### Junior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 404	3 H S 350	3
KIN 366 or 365	3 KIN 355	3
KIN 372	3 PHYS 132	4
PHYS 131	4 PHYS 132L	1
PHYS 131L	1 Electives	3
SP CM 212	3 Humanities Choice	3
<b>17</b>		<b>17</b>

### Senior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 302, 314, or SP CM 312	3 BIOL 313, 314, 328, 335, 350, or BBMB 405	3-4
KIN 358	3 Electives (300+ Level Courses)	3
KIN 359	1 KIN 400 Level Courses *	9
KIN 373	1	
Electives (300+ Level Courses)	3	
Humanities Choice	3	
Social Science Choice	3	
<b>17</b>		<b>15-16</b>

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Human Medicine

### Freshman

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 H S 110	3
KIN 252	1 MATH 165	4
KIN 253	1	
LIB 160	1	
<b>15</b>		<b>15</b>

Sophomore			H S 110	3 MATH 140, 143, 145, or 165	3-4		
Fall	Credits	Spring	Credits	KIN 252	1 SOC 134	3	
BIOL 255	3	BIOL 256	3	KIN 253	1 Humanities Choice	3	
BIOL 255L	1	BIOL 256L	1	LIB 160	1		
CHEM 331	3	CHEM 332	3	PSYCH 101	3		
CHEM 331L	1	CHEM 332L	1	16		15-16	
ENGL 250	3	SOC 134	3	Sophomore			
KIN 242	0.5	STAT 101 or 104	3-4	Fall	Credits	Spring	Credits
KIN 258	2			BIOL 255	3	BIOL 256	3
PSYCH 101 or 230	3			BIOL 255L	1	BIOL 256L	1
16.5			14-15	CHEM 163 or 177	4	PHYS 115 or 131 <i>and</i> 131L	4-5
Junior				CHEM 163L or 177L	1	Electives	3
Fall	Credits	Spring	Credits	ENGL 250	3	Humanities Choice	3
BBMB 404	3	BIOL 313, 314, 328, 335, 350, or BBMB 405	3-4	KIN 242	0.5		
KIN 366 or 365	3	H S 350	3	PSYCH 230	3		
KIN 372	3	KIN 355	3	Elective	1		
PHYS 131	4	PHYS 132	4	16.5		14-15	
PHYS 131L	1	PHYS 132L	1	Junior			
SP CM 212	3	Humanities Choice	3-4	Fall	Credits	Spring	Credits
17			17-19	KIN 366 or 365	3	FS HN 367	1
Senior				KIN 372	3	H S 350	3
Fall	Credits	Spring	Credits	SP CM 212	3	KIN 355	3
ENGL 302, 314, or SP CM 312	3	KIN 400 Level Courses *	9	STAT 101 or 104	3-4	PHIL 331	3
KIN 358	3	Electives	2	Electives	3	Electives (300+ Level Courses)	6
KIN 359	1	Humanities Choice	3	15-16		16	
KIN 373	1			Senior			
Electives (300+ Level Courses)	6			Fall	Credits	Spring	Credits
Social Sciences Choice	3			ENGL 302, 314, or SP CM 312	3	KIN 400 Level Courses *	9
17			14	KIN 358	3	PSYCH, SOC, or Humanities Choice	3
				KIN 359	1	Elective	1
				KIN 373	1	Electives (300+ Level Courses)	3

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Occupational Therapy

### Freshman

Fall	Credits	Spring	Credits
BIOL 211	3	BIOL 212	3
BIOL 211L	1	BIOL 212L	1
ENGL 150	3	KIN 258	2

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Optometry (Pharmacy)

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 H S 110	3
KIN 252	1 MATH 165	4
KIN 253	1	
LIB 160	1	
	<b>15</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
CHEM 331	3 CHEM 332	3
CHEM 331L	1 CHEM 332L	1
ENGL 250	3 SOC 134	3
KIN 242	0.5 Humanities Choice	3
KIN 258	2	
PSYCH 101 or 230	3	
	<b>16.5</b>	<b>14</b>

### Junior

Fall	Credits Spring	Credits
BBMB 404 or 420	3 H S 350	3
KIN 366 or 365	3 KIN 355	3
KIN 372	3 PHYS 132	4
PHYS 131	4 PHYS 132L	1
PHYS 131L	1 STAT 101 or 104	3-4
SP CM 212	3 Electives (300+ Level Courses)	3
	<b>17</b>	<b>17-18</b>

### Senior

Fall	Credits Spring	Credits
ENGL 302, 314, or SP CM 312	3 KIN 400 Level Courses *	9
KIN 358	3 MICRO 201 or 302	2-3

KIN 359	1 MICRO 201L or 302L	1
KIN 373	1 Electives (300+ Level Courses)	3
Electives (300+ Level Courses)	3	
Humanities Choice	3	
Social Science Choice	3	
	<b>17</b>	<b>15-16</b>

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Physical Therapy

### Freshman

Fall	Credits Spring	Credits
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
ENGL 150	3 KIN 258	2
H S 110	3 MATH 143, 145, or 165	3-4
KIN 252	1 PSYCH 101	3
KIN 253	1 Humanities Choice	3
LIB 160	1	
SOC 134	3	
	<b>16</b>	<b>15-16</b>

### Sophomore

Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 250	3 FS HN 367	1
KIN 242	0.5 Electives	3
Humanities Choice	3 PSYCH Choice	3
	<b>15.5</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
KIN 366 or 365	3 H S 350	3
KIN 372	3 KIN 355	3
PHYS 131	4 PHYS 132	4
PHYS 131L	1 PHYS 132L	1
SP CM 212	3 PSYCH 460	3

STAT 101 or 104	3-4 Elective	1
<b>17-18</b>		<b>15</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 302, 314, or SP CM 312	3 KIN 400 Level Courses *	9
KIN 358	3 Electives (300+ Level Courses)	6
KIN 359	1	
KIN 373	1	
Electives (300+ Level Courses)	9	
<b>17</b>		<b>15</b>

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Kinesiology and Health, B.S. - Pre-Health Professions - Physician Assistant

### Freshman

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
ENGL 150	3 H S 110	3
KIN 252	1 MATH 140, 143, 145, or 165	3-4
KIN 253	1 PSYCH 101	3
LIB 160	1	
<b>15</b>		<b>17-18</b>

### Sophomore

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BIOL 255	3 BIOL 256	3
BIOL 255L	1 BIOL 256L	1
CHEM 231 or 331	3 SOC 134	3
CHEM 231L or 331L	1 SP CM 212	3
ENGL 250	3 STAT 101 or 104	3-4
KIN 242	0.5 Humanities Choice	3
KIN 258	2	
PSYCH 230	3	
<b>16.5</b>		<b>16-17</b>

### Junior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 316 or 404	3 BIOL 313	3
KIN 366 or 365	3 BIOL 313L	1
KIN 372	3 FS HN 367	1
PSYCH 460	3 H S 350	3
Humanities Choice	3 PHYS 115 or 131 <i>and</i> 131L	4-5
	Electives	3
<b>15</b>		<b>15-16</b>

### Senior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 302, 314, or SP CM 312	3 KIN 400 Level Courses *	9
KIN 355	3 Electives (300+ Level Courses)	3
KIN 358	3 Electives	3
KIN 359	1	
KIN 373	1	
MICRO 302	3	
MICRO 302L	1	
Elective	1	
<b>16</b>		<b>15</b>

\* KIN 400 Level Course Choices (9 cr): KIN 458, 462, 466, 467, 472, 473, 480, H S 464.

## Minors

### Dance

The minor requires a minimum of 15 credits and may be earned by completing the following:

6 cr. from the following:

DANCE 270	Dance Appreciation	3
DANCE 320	Sound and Movement	3
DANCE 360	History and Philosophy of Dance	3

4 cr. from the following:

DANCE 220	Modern Dance Composition	2
DANCE 384	Teaching Children's Dance	2
DANCE 385	Methods of Teaching Dance	2
DANCE 386	Teaching Dance Technique and Composition	2

5 cr. from the following:

DANCE 222	Modern Dance II	1
DANCE 223	Modern Dance III	1
DANCE 224	Concert and Theatre Dance	1

DANCE 232	Ballet II	1
DANCE 233	Ballet III	1
DANCE 242	Jazz II	1
DANCE 250	Yoga Movement	1
DANCE 370	Advanced Studies in Dance	1
DANCE 490	Independent Study	1

### **Exercise Science**

The minor requires a minimum of 18 credits and may be earned by completing the following:

KIN 258	Principles of Physical Fitness and Conditioning	2
KIN 358	Exercise Physiology	3
KIN 359	Exercise Physiology Lab	1
KIN 366	Exercise Psychology	3
KIN 458	Principles of Fitness Assessment and Exercise Prescription	4
5 cr. from the following		
A TR 220	Basic Athletic Training	
KIN 259	Leadership Techniques for Fitness Programs	
KIN 266	Advanced Strength Training and Conditioning	
KIN 345	Management of Health-Fitness Programs and Facilities	
KIN 462	Medical Aspects of Exercise	
KIN 467	Exercise and Health: Behavior Change	

### **Health Promotion**

The minor requires a minimum of 18 credits and may be earned by completing the following:

H S 110	Personal and Consumer Health	3
H S 350	Human Diseases	3
H S 380	Worksite Health Promotion	3
3-6-cr. from the following		
H S 305	Instructor's First Aid and Cardiopulmonary Resuscitation	
H S 310	Community and Public Health	
3-6 cr. from the following		
H S 430	Community Health Program Development	
H S 464	Physical Activity Epidemiology	
KIN 467	Exercise and Health: Behavior Change	

### **Kinesiology**

The minor requires a minimum of 16 credits and may be earned by completing the following: (For non-majors only)

KIN 355	Biomechanics	3
KIN 358	Exercise Physiology	3
KIN 359	Exercise Physiology Lab	1
KIN 360	Sociology of Physical Activity and Health	3
KIN 372	Motor Control and Learning Across the Lifespan	3
KIN 365	Sport Psychology	3
or KIN 366	Exercise Psychology	

### **Gerontology**

The department participates in the interdepartmental minor in gerontology (see Index).

### **Health Coach Certificate**

Students pursuing a bachelor's degree in kinesiology can seek additional credentials through the Health Coach Certificate. More information on the certificate can be found at: Health Coach Certificate.

The Kinesiology Department offers two concurrent undergraduate and graduate programs.

### **B.S./M.A.T.R. degree in Athletic Training**

Certified Athletic Trainers are allied medical health professionals who specialize in the prevention, assessment, treatment and rehabilitation of injuries to athletes and physically active individuals who are engaged in physical and athletic activities. To gain certification, candidates must graduate from a CAATE accredited athletic training education program and successfully pass the Board of Certification (BOC) examination.

In addition to BOC certification, many states also have licensure requirements to practice athletic training. The Athletic Training program at Iowa State University, accredited since 2001 has transitioned to the new M.A.T.R. degree program, which includes various athletic training clinical rotations including high school, physical therapy clinics, surgical observation experiences, and emergency room observation.

More information on the B.S./M.A.T.R. degree in Athletic Training.

### **B.S./M.S. DEGREE IN DIET AND EXERCISE**

A combined Bachelor of Science and Master of Science (B.S./M.S.) degree in Diet and Exercise is available. The program is jointly administered by the Department of Food Science and Human Nutrition (FS HN), and the Department of Kinesiology. Students interested in this program must enroll as freshmen in the Pre-Diet and Exercise program. In the fall of the junior year, students will apply for admission to the B.S./M.S. program. Students not accepted into the program will continue toward completion of a B.S. degree in Dietetics or Kinesiology & Health. Coursework has been designed to facilitate a 4-year graduation date for those students not accepted into the program and electing to complete a single undergraduate degree. Students accepted into the program will progress toward completion of B.S./M.S. degrees in Diet and Exercise.



More information can be found at: <https://fshn.hs.iastate.edu/find-your-major/diet-and-exercise/>

## Graduate Study

The Department of Kinesiology graduate program seeks to integrate discovery and learning by preparing graduate students to understand and create basic and applied knowledge in the study of physical activity, exercise and sport. The normal prerequisite to major graduate work is the satisfactory completion of a curriculum essentially equivalent to that required of undergraduate students in kinesiology at this university. However, it is possible for students to qualify for graduate study if undergraduate preparation has been in a related area.

Students in the M.S. and Ph.D. degrees are required to complete original research and write a thesis or dissertation. There is a non-thesis degree option for M.S. students requiring more coursework and an internship experience or other creative component. Specific information about the requirements for these degree options is available from the department office or from the department web site (<http://www.kin.hs.iastate.edu/graduate> (<http://www.kin.hs.iastate.edu/graduate/>)).

## Nursing OVERVIEW

The Bachelor of Science in Nursing (BSN) program at Iowa State University is a RN-to-BSN program, designed for those who are already a Registered Nurse (RN), and desire to further their nursing career and education to the next level. Iowa State's RN-to-BSN program provides interactive learning opportunities where students can apply their real-world experiences and education to inspire innovation in their places of care. RN-to-BSN students will be challenged to enhance health promotion and disease prevention, apply nursing science and evidenced-based patient-centered care, focus on the culture of health for nurses, individuals, and communities, and demonstrate the continuum of care, from a nurse's self-care to patient care to community and population health.

Students in the Bachelor of Science in Nursing program who wish to add an additional major, must pursue multiple degrees. Likewise, students in other programs who wish to add a Bachelor of Science in Nursing must pursue multiple degrees.

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is approved by the:

### Iowa Board of Nursing (IBON)

Riverpoint Business Park  
400 SW 8th St., Suite B  
Des Moines, IA 50309  
(515) 281-3255

The baccalaureate nursing program at Iowa State University of Science and Technology located in Ames, Iowa is accredited by the:

### Accreditation Commission for Education in Nursing (ACEN)

3390 Peachtree Road NE, Suite 1400  
Atlanta, GA 30326  
(404) 975-5000

The most recent accreditation decision made by the ACEN Board of Commissioners for the baccalaureate nursing program is initial accreditation.

View the public information disclosed by the ACEN regarding this program at <http://www.acenursing.com/accreditedprograms/programSearch.htm>

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Synthesize theory and concepts from the arts and humanities, natural and social sciences, and nursing in the holistic practice of professional nursing.
2. Integrate knowledge of historical and contemporary nursing with leadership skills and principles to facilitate optimal patient and systems outcomes.
3. Translate research findings to support evidence-based, competent, safe, and effective nursing care to individuals, families, and communities in diverse settings across the lifespan.
4. Utilize current technology effectively and efficiently to communicate, manage knowledge, mitigate error, support decision making and accomplish goals related to the delivery of safe, quality care for diverse individuals, families, and the community.
5. Examine how healthcare policies, including financial and regulatory, influence healthcare systems, nursing practices and population health.
6. Incorporate principles of effective communication and collaboration when working with members of the health team, recipients of care and interested groups to improve health outcomes for individuals, groups and communities.
7. Integrate concepts of health promotion and disease management, health literacy and patient-centered care to improve population health.
8. Engage in professional, culturally competent, and ethically congruent care that reflects dignity and uniqueness of individuals and groups in diverse populations and locations.
9. Demonstrate a commitment to professionalism and model the values of advocacy, compassion, integrity, human dignity, cultural competence and social justice while embracing the concept of continuous learning.

## RN-to-BSN Admissions Criteria

Applications for the RN-to-BSN program are individually reviewed.

Minimum requirements for admission to the BSN program include:

- Licensure as a Registered Nurse
- Meet all Iowa State University admission criteria for transfer students
- Official college transcripts from all colleges and universities attended
- Minimum of 2.5 cumulative GPA for all college coursework
- Achievement of minimum "C" (not C-) for all prerequisite courses listed below

English Composition I and II (ENGL 150 and ENGL 250 equivalent)

Introduction to Chemistry (CHEM 163 or CHEM 1T equivalent)

Statistics (STAT 101 or STAT 104 equivalent)

Introduction to Human Nutrition (FS HN 167 equivalent)

Introduction to Sociology (SOC 134 equivalent)

Admissions requirements are congruent with the Iowa Action Coalition, RN-to-BSN Task Force Recommendations.

## RN-to-BSN Progression Criteria

- Must earn a "C" grade or better in all NRS courses and meet the university's academic standards for progress toward a degree

## RN-to-BSN Graduation Requirements

- At least 32 credits earned in residence at Iowa State University, and the final 32 credits taken through Iowa State University prior to graduation.
- All general education requirements at Iowa State University must be met.
- The BSN curriculum consists of 21 credits of NRS courses, 8 credits of FS HN courses, and 3 elective credits for a total of 32 credits in addition to prerequisite coursework.
- Electives are selected by students to meet identified career interests, and total elective credits needed will vary based on individual transfer credits.
- Minimum credits for graduation is 120 credits.

### International Perspectives: 3 cr.

### U.S. Diversity: 3 cr.

### Communications and Library: 10 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
Oral Communication course, select from:		3
COMST 214 Professional Communication		
SP CM 212 Fundamentals of Public Speaking		

### Humanities and Social Sciences: 3 cr.

SOC 134	Introduction to Sociology	3
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### College of Human Sciences Students Only: Additional Humanities and Social Sciences: 9 cr.

Humanities courses from approve list <sup>1</sup>		6
Humanities or social science course		3

### College of Agriculture & Life Science Students Only: Additional Humanities and Social Sciences: 6 cr.

Humanities course from approved list <sup>1</sup>		3
Ethics course from approved list <sup>2</sup>		3

<sup>1</sup> Approved Humanities course list (<https://www.cals.iastate.edu/student-services/humanities/>)

<sup>2</sup> Approved Ethics course list (<https://www.cals.iastate.edu/student-services/ethics/>)

### Math, Physical, & Biological Sciences: 7-8 cr.

Statistics course, select from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
CHEM 163	College Chemistry	4
<b>Total Credits</b>		<b>7-8</b>

### College of Agriculture & Life Sciences students only: Additional Math, Physical & Biological Sciences: 7-8 crs.

Select math course: MATH 104, MATH 105, MATH 140, MATH 143, MATH 145, MATH 150, MATH 151, MATH 160, or MATH 165		3-4
Select biology course: BIOL 101, BIOL 211, or BIOL 212		3
CHEM 163L	Laboratory in College Chemistry	1
<b>Total Credits</b>		<b>7-8</b>

### Nursing Courses: 21 cr.

NRS 250	Orientation to RN - to - BSN Nursing	1
NRS 320	Essential Concepts for Professional Nursing Practice	3
NRS 340	Nursing Research and Evidence-Based Practice	4
NRS 420	Promoting a Culture of Health and Wellness	3
NRS 440	Population and Community Health Nursing <sup>†</sup>	3
NRS 442	Population and Community Health Nursing Practicum	1
NRS 460	Nursing Leadership and Management	3
NRS 480	Advanced Concepts of Professional Nursing	3
<b>Total Credits</b>		<b>21</b>

<sup>†</sup> May fulfill the U.S. Diversity Requirement - check current list

**Select at least 3.0 credits of elective: 3 cr.**  
**Nutrition: 8 cr.**

FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 430	U.S. Health Systems and Policy	2
<b>Total Credits</b>		<b>8</b>

**Electives: Select from any university coursework to earn at least ≥ 120 total credits prior to graduation.**

**Total credits for Nursing major = 32**

### Full-Time Enrollment Option

#### First Year

Fall	Credits Spring	Credits
NRS 250	1 NRS 440	3
NRS 320	3 NRS 442*	1
NRS 340	4 NRS 460	3
NRS 420	3 NRS 480	3
FS HN 364**	3 FS HN 365**	3
FS HN 430**	2 Elective or U.S. Diversity as needed**	3
<b>16</b>		<b>16</b>

**Total Credits: 32**

### Part-Time Enrollment Option

#### First Year

Fall	Credits Spring	Credits
NRS 250	1 NRS 460	3
NRS 320	3 FS HN 365**	3
NRS 340	4 FS HN 430**	2
<b>8</b>		<b>8</b>

#### Second Year

Fall	Credits Spring	Credits
NRS 420	3 NRS 440	3
FS HN 364**	3 NRS 442*	1
Elective or U.S. Diversity as needed**	3 NRS 480	3
<b>9</b>		<b>7</b>

**Total Credits: 32**

\* Denotes Practicum Courses.

\*\* Denotes courses that may be taken before starting the nursing program.

Note Plan of study does not include any unmet ISU general education requirements.

## Nutritional Science (H SCI)

Nutritional science looks at the connection between diet and health.

Students learn how diet can play a crucial role in the cause, treatment, and prevention of many diseases. There are degree program focuses within nutritional science:

- Pre-health and research coursework prepares students for work in research laboratories, graduate study in nutrition or biological sciences, or entrance into health professional programs, such as medical, dental, physician assistant, and pharmacy schools. Students gain a strong science education along with human nutrition expertise.
- Health coach and nutrition and wellness coursework prepares students for work positions in program planning and evaluation for community, public health, non-profit, and corporate wellness programs addressing the growing public interest in nutrition, wellness, and preventative health. Students learn about the role of nutrition and healthy eating for disease prevention and wellness.

The department also offers a nutrition minor.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Communicate effectively in their field of study using written, oral, visual and/or electronic forms.
- Demonstrate proficiency in ethical data collection and interpretation, literature review and citation, critical thinking and problem solving.
- Participate effectively in a group or team.
- Integrate creativity, innovation, or entrepreneurship in ways that produce value.
- Describe sociocultural competence relative to diversity, equity and/or inclusion.
- Explain how human activities impact the natural environment and how societies are affected.
- Meet program specific learning outcomes for the Nutritional Science major.

The department also offers a nutrition minor.

## Degree Requirements

**Administered by the Department of Food Science and Human Nutrition**

- Pre-Health and Research Program Focus
- Health Coach Program Focus
- Nutrition and Wellness Program Focus

## PRE-HEALTH AND RESEARCH PROGRAM FOCUS

### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

#### International Perspectives: 3 cr.

#### U.S. Diversity: 3 cr.

#### Communications and Library: 13 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
Select from:		3
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3

**Total Credits** 13

#### Humanities and Social Sciences: 6-12 cr.

Select Humanities courses from approved list	3
Select Social Science course from approved list	3
If H Sci student, select:	6
Additional Humanities course	
Additional Humanities or Social Science course	

#### Ethics: 3 cr.

FS HN 342	World Food Issues: Past and Present	3
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#### Mathematical Sciences: 6-12 cr.

Select at least 3 credits from:		3-8
MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
MATH 165 & MATH 166	Calculus I and Calculus II	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	

**Total Credits** 6-12

#### Physical Sciences: 13 cr.

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3

CHEM 178L	Laboratory in College Chemistry II	1
CHEM 231	Elementary Organic Chemistry	3
or CHEM 331	Organic Chemistry I	
CHEM 231L	Laboratory in Elementary Organic Chemistry	1
or CHEM 331L	Laboratory in Organic Chemistry I	

**Total Credits** 13

#### Biological Sciences: 24-29 cr.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1

Select at least 3 credits from: 3-4

BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	
or BIOL 335	Principles of Human and Other Animal Physiology	

BIOL 313	Principles of Genetics	3
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Select at least 3 credits from: 3-6

BBMB 301	Survey of Biochemistry	
BBMB 316	Principles of Biochemistry	
BBMB 404 & BBMB 405	Biochemistry I and Biochemistry II	

MICRO 201	Introduction to Microbiology	2-3
or MICRO 302	Biology of Microorganisms	

MICRO 201L	Introductory Microbiology Laboratory	1
or MICRO 302L	Microbiology Laboratory	

**Total Credits** 24-29

#### Food Science and Human Nutrition: 30 cr.

FS HN 110	Professional and Educational Preparation	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 360	Advanced Nutrition and the Regulation of Metabolism in Health and Disease	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 362	Nutrition and Health Throughout the Lifecycle	3
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 492	Research Concepts in Human Nutrition	2

Select at least 10 additional credits from: 10

FS HN 203	Contemporary Issues in Food Science and Human Nutrition	
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FS HN 214 & FS HN 215	Scientific Study of Food and Advanced Food Preparation Laboratory (or FS HN 115 lab)
FS HN 242	The US Food System
FS HN 267X	Clinical Perspectives on Human Nutrition and Health
FS HN 301	Nutrigenomics: From Basic Science to Translational Impact
FS HN 364	Nutrition and Prevention of Chronic Disease
FS HN 365	Obesity and Health
FS HN 367	Medical Terminology for Health Professionals
FS HN 430	U.S. Health Systems and Policy
FS HN 460	Global Nutrition and Health
FS HN 461	Medical Nutrition and Disease I
FS HN 463	Community Nutrition and Health
FS HN 464	Medical Nutrition and Disease II
FS HN 466	Nutrition Counseling and Education Methods
FS HN 490C	Independent Study: Nutrition
FS HN 499	Undergraduate Research
NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients
NUTRS 504	Nutrition and Epigenetic Regulation of Gene Expression
BIOL 314	Principles of Molecular Cell Biology
CHEM 332	Organic Chemistry II
CHEM 332L	Laboratory in Organic Chemistry II
PHYS 131 & 131L	General Physics I and General Physics I Laboratory
	or PHYS 231 Introduction to Classical Physics I & 231L and Introduction to Classical Physics I Laboratory
PHYS 132 & 132L	General Physics II and General Physics II Laboratory
	or PHYS 232 Introduction to Classical Physics II & 232L and Introduction to Classical Physics II Laboratory
<b>Total Credits</b>	<b>30</b>

**Electives: 2-25 cr. Select from any university coursework to earn at least 120 total credits. Students planning to apply to health professional programs should review entrance requirements and select appropriate courses as electives.**

Concurrent B.S. and M.S. Program: Well-qualified students in Nutritional Science, pre-health and research option, who are interested in graduate study may apply for concurrent enrollment in the Graduate College to simultaneously pursue both a Bachelor of Science (B.S.) degree in Nutritional Science and a Master of Science (M.S.) degree in Nutritional

Sciences. For more information, refer to [www.fshn.hs.iastate.edu](http://www.fshn.hs.iastate.edu) (<http://www.fshn.hs.iastate.edu>)

## HEALTH COACH / NUTRITION & WELLNESS PROGRAM FOCUS

### Total Degree Requirement: 120 cr.

Students must fulfill International Perspectives and U.S. Diversity requirements by selecting coursework from approved lists. These courses may also be used to fulfill other area requirements. Only 65 cr. from a two-year institution may apply to the degree which may include up to 16 technical cr.; 9 P-NP cr. of electives; 2.00 minimum GPA.

### International Perspectives: 3 cr.

### U.S. Diversity: 3 cr.

### Communications/Library: 10 cr.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>10</b>

### Humanities and Social Sciences: 12-15 cr.

Select Humanities course from approved list		3
PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
SOC 134	Introduction to Sociology	3
FS HN 342	World Food Issues: Past and Present (this course can also meet the IP requirement)	3
If H Sci student, select additional Humanities course		3

### Mathematical Sciences: 6-8 cr.

Select at least 3 credits from:		3-4
MATH 140	College Algebra	
MATH 143	Preparation for Calculus	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Select at least 3 credits from:		3-4
STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>6-8</b>

### Physical Sciences: 5 cr.

CHEM 163	College Chemistry	4
or CHEM 177	General Chemistry I	
CHEM 163L	Laboratory in College Chemistry	1
or CHEM 177L	Laboratory in General Chemistry I	
<b>Total Credits</b>		<b>5</b>

**Biological Sciences: 18-19 cr.**

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 255L	Fundamentals of Human Anatomy Laboratory	1
BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	3-4
or BIOL 335	Principles of Human and Other Animal Physiology	
MICRO 201	Introduction to Microbiology	2
MICRO 201L	Introductory Microbiology Laboratory	1

**Total Credits** 18-19

**Food Systems: 8 cr.**

FS HN 242	The US Food System	3
FS HN 342	World Food Issues: Past and Present (course shown above)	3
FS HN 442	Issues in Food and Society	2

**Total Credits** 8

**Food Science and Human Nutrition: 34 cr.**

FS HN 101	Food and the Consumer	3
FS HN 110	Professional and Educational Preparation	1
FS HN 111	Fundamentals of Food Preparation	2
FS HN 115	Food Preparation Laboratory	1
FS HN 167	Introductory Human Nutrition and Health	3
FS HN 203	Contemporary Issues in Food Science and Human Nutrition	1
FS HN 264	Fundamentals of Nutritional Biochemistry	3
or BBMB 301	Survey of Biochemistry	
FS HN 265	Nutrition for Active and Healthy Lifestyles	3
FS HN 361	Nutrition and Health Assessment	2
FS HN 364	Nutrition and Prevention of Chronic Disease	3
FS HN 365	Obesity and Health	3
FS HN 430	U.S. Health Systems and Policy	2
FS HN 445	Strategies for Personal Food Waste Reduction	1
FS HN 463	Community Nutrition and Health	3
COMST 450B	Special Topics in Communication Studies: Health Communication	3

**Total Credits** 34

**Additional courses for Health Coach Program Focus: 18 credits**

KIN 258	Principles of Physical Fitness and Conditioning	2
KIN 358	Exercise Physiology	3
KIN 458	Principles of Fitness Assessment and Exercise Prescription	4
PSYCH 101	Introduction to Psychology	3
or PSYCH 230	Developmental Psychology	
PSYCH 422	Counseling Theories and Techniques	3
PSYCH 485	Health Psychology	3

**Total Credits** 18

Select additional electives to reach 120 total semester credits.

**Additional courses for Nutrition & Wellness Program Focus: 18-30 credits of electives**

At least 9 credits of electives must be 300-400 level courses. Select from any university coursework to earn at least 120 total credits.

NOTE:

Students are encouraged to pursue a minor, such as:

- Communication studies
- Culinary food science
- Entrepreneurship
- Environmental studies
- Event management
- Exercise science
- Global health
- Health promotion
- Hospitality management
- Human development and family studies
- Leadership studies
- Sustainability

Go to FS HN courses.

**Nutritional Science, B.S.  
Program Focus: Health Coach<sup>1</sup>, Nutrition & Wellness<sup>2</sup>****First Year**

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 101	3
FS HN 167	3 CHEM 163 or 177	4
MATH 140, 143, 160, or 165	3-4 CHEM 163L or 177L	1
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1



ENGL 150	3 Course based on program focus:	3	300-400 level elective <sup>2</sup>	Electives (choose electives to total at least 120 credits)	4-6
LIB 160	1 PSYCH 101 or 230 <sup>1</sup> Elective <sup>2</sup>			<b>14</b>	<b>13-15</b>

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**15-16** **15**

**Second Year**

Fall	Credits Spring	Credits
MICRO 201	2 FS HN 203	1
MICRO 201L	1 FS HN 242	3
FS HN 264	3 FS HN 265	3
BIOL 255	3 BIOL 256 and 256L, or 335	3-4
BIOL 255L	1 FS HN 111	2
ENGL 250	3 FS HN 115	1
Course based on program focus:	2-3	
KIN 258 <sup>1</sup>		
Elective <sup>2</sup>		
	<b>15-16</b>	<b>13-14</b>

**Third Year**

Fall	Credits Spring	Credits
FS HN 364	3 FS HN 342	3
PSYCH 101 or 230	3 FS HN 361	2
SP CM 212	3 FS HN 365	3
STAT 104 or 101	3-4 COMST 450B	3
Course based on program focus:	3 Humanities (H Sci) or elective (AgLS)	3
KIN 358 <sup>1</sup>	Course based on program focus:	3
Elective <sup>2</sup>	PSYCH 485 <sup>1</sup> 300-400 level elective <sup>2</sup>	
	<b>15-16</b>	<b>17</b>

**Fourth Year**

Fall	Credits Spring	Credits
FS HN 442	2 FS HN 445	1
FS HN 463	3 FS HN 430	2
Humanities	3 Course based on program focus:	3
SOC 134	3 KIN 458 <sup>1</sup>	
Course based on program focus:	3 300-400 level elective <sup>2</sup>	
PSYCH 422 <sup>1</sup>	U.S. Diversity	3

1, 2 Courses for program focus: Health Coach<sup>1</sup>, Nutrition & Wellness<sup>2</sup>  
 Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

## Nutritional Science, B.S.

### Program Focus: Pre-Health & Research

**First Year**

Fall	Credits Spring	Credits
FS HN 110	1 FS HN 167	3
CHEM 177	4 CHEM 178	3
CHEM 177L	1 CHEM 178L	1
BIOL 211	3 BIOL 212	3
BIOL 211L	1 BIOL 212L	1
ENGL 150	3 MATH 140, 143, 160, or 165	3-4
LIB 160	1	
Humanities	3	
	<b>17</b>	<b>14-15</b>

**Second Year**

Fall	Credits Spring	Credits
CHEM 231 or 331	3 FS HN 265	3
CHEM 231L or 331L	1 BBMB 301 or 316, or BBMB 404 and 405 the next year	3
BIOL 313	3 Social Science	3
STAT 101 or 104	3-4 Humanities (H Sci) or elective	3
ENGL 250	3 Elective *	3
SP CM 212	3	
	<b>16-17</b>	<b>15</b>

**Third Year**

Fall	Credits Spring	Credits
BIOL 255	3 BIOL 256 and 256L, or 335	3-4
BIOL 255L	1 FS HN 361	2
FS HN 360	3 FS HN 362	3
FS HN 342	3 Humanities/Social Sci. (H Sci) or elective (AgLS) *	3
MICRO 201 or 302	2-3 Additional course from approved list **	3

MICRO 201L or 302L	1	
Elective*	3	
<b>16-17</b>		<b>14-15</b>
<b>Fourth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
FS HN 492	2 FS HN 467	3
Additional course from approved list**	3 ENGL 302, 309, or 314	3
Additional course from approved list**	3 US Diversity (if not already taken) or elective*	3
Additional course from approved list**	1 Elective*	3-4
Elective*	3 Elective*	3
Elective*	3	
<b>15</b>		<b>15-16</b>

\* Choose elective courses to total equal to or greater than 120 credits.

\*\* Select at least 10 additional credits from: BIOL 314; CHEM 332, CHEM 332L; FS HN 214 with lab (FS HN 115 or FS HN 215); FS HN 203, FS HN 242, FS HN 267X, FS HN 301, FS HN 364, FS HN 365, FS HN 367, FS HN 430, FS HN 460, FS HN 461, FS HN 463, FS HN 464, FS HN 466, FS HN 490C, FS HN 499; NUTRS 501, NUTRS 504; PHYS 131 or PHYS 231/PHYS 231L; PHYS 132 or PHYS 232/PHYS 232L.

Note: This sequence is only an example. The number of credits taken each semester should be based on the individual student's situation. Factors that may affect credit hours per semester include student ability, employment, health, activities, and grade point consideration.

More information on the Nutrition minor can be found here: <http://catalog.iastate.edu/collegeofagricultureandlifesciences/foodscienceandhumannutrition/#undergraduateminortext>.

The Department of Food Science and Human Nutrition offers a Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) in Nutritional Sciences. More information can be found here: <https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=84>.

## Professional Practice in Dietetics

### Master of PROFESSIONAL PRACTICE IN DIETETICS (M.P.P.)

The Department of Food Science and Human Nutrition offers a 30-credit, non-thesis, online, professional master's degree with two possible tracks. Track 1 (RD2B track) is for individuals who are interested in becoming

Registered Dietitian Nutritionists and track 2 (DI track) is for graduates of a dietetic internship (DI) who wish to earn a master's degree. Students interested in further graduate study (PhD) may require additional coursework and/or research beyond the MPP to gain admission into a doctoral program.

The RD2B track is accredited by the Accreditation Council for Education in Nutrition and Dietetics (ACEND). Admission requirements for this MPP track include successful completion of at least a Bachelor's degree and a verification statement from any ACEND accredited didactic program in dietetics (DPD). A minimum GPA of 3.0 (on a 4.0 scale) both overall and in the DPD are desired. A professional goal statement ( $\leq 750$  words), three letters of recommendation from faculty, work supervisors or those who can attest to the applicant's ability to succeed in an online program in the field of dietetics are also required. Students in the DI track, must have successfully completed a graduate DI and may be eligible to transfer some of these graduate DI courses towards the MPP. The Graduate Record Examination (GRE) is not required for either track.

More information on the program can be found here: <https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=140>.

## School of Education

Mary Gresham, Interim Director of the School of Education

School of Education (<http://www.education.iastate.edu>)

The School of Education at Iowa State University is committed to engaging in rigorous and socially meaningful research. We are preparing leaders and practitioners across the P-20 continuum who support rich, equitable learning opportunities for all students. Supporting public education as a cornerstone of a healthy, vibrant, and just society, the School of Education strives to be a national leader in educational theory, policy, and practice, as we honor the land-grant tradition and the broader mission of the university to serve the people of Iowa.

## Undergraduate Study

The School of Education provides the professional education coursework to support the completion of the Educator Preparation Program. Program completers can then be recommended for licensure to the Iowa Board of Education Examiners. Majors offered in the School include **Elementary Education (K-6)**, and **Early Childhood Education-Unified (birth through third grade, inclusive)**. The Early Childhood Education-Unified major is an interdepartmental program administered by the School of Education and the Department of Human Development and Family Studies. In addition, the School of Education offers the secondary major in Education. This secondary major is available to candidates pursuing English Education,

History/Social Sciences Education, Mathematics Education, Science Education, and World Languages and Cultures Education.

Undergraduate students who are interested in teaching at the secondary level (5-12) or at the K-12 level major in a specific discipline and either pursue the secondary major in Education or complete additional required educational coursework in the School of Education and the department to complete the Educator Preparation Program. K-12 and secondary education programs include: Agriculture Education, English Education, Family and Consumer Sciences Education, Health Education, History-Social Sciences Education, Mathematics Education, Music Education, Physical Education, Science Education (Biology, Chemistry, Earth Science, and Physics), and World Languages and Cultures Education (French, German, and Spanish).

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehixe12epxtekxax/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

All Educator Preparation Program candidates must complete the professional core coursework (information found under each program) and required pedagogy and field experience coursework for their program. In addition, all prospective teachers are required to meet general education requirements as a part of their preparation. They must complete studies in the following general education groups. General education courses may be found in many departments. Credits listed are minimum requirements. Specific departments and/or colleges may require specific coursework to meet these requirements or additional

credits. Credits used to satisfy these general education requirements typically satisfy department and college general education requirements:

For Educator Preparation general education requirements, please visit the School of Education website: <https://education.iastate.edu/current-students/educator-preparation-program/resources/curriculum-requirements/>.

## Early Childhood Education – Unified

The curriculum in Early Childhood Education – Unified prepares graduates to teach young children and work with their families. This program leads to careers working with young children (both those who are typically developing and those with special needs) from birth through third grade, inclusive. Program completers who apply for licensure are recommended for licensure to the Iowa Board of Educational Examiners. Individuals who are licensed may be employed by either public or private agencies or schools to teach in early childhood classrooms (preschool through 3rd grade) or in home-based programs. The program is an interdepartmental major administered by the Department of Human Development and Family Studies and the School of Education. For more information about the program, see Early Childhood Education - Unified Curriculum <https://hdfs.hs.iastate.edu/find-your-major/early-childhood-education/>.

Students who enroll in the early childhood education – unified program must apply to and be accepted into the Educator Preparation Program prior to enrolling in advanced courses. Admission requirements can be found at: <https://www.education.iastate.edu/educator-prep-program/admission/>.

Early Childhood Education majors must complete all of the required degree curriculum. This can be found at: [http://catalog.iastate.edu/collegeofhumansciences/earlychildhood\\_education/](http://catalog.iastate.edu/collegeofhumansciences/earlychildhood_education/)

**Candidates must receive a minimum of a “C” in all education (EDUC), human development and family studies (HD FS), special education (SP ED) courses and all content-specific pedagogy/methods courses required for program completion and endorsement completion.**

**Candidates must receive a minimum of a “C-” in all major department courses/content courses required for teacher program completion and endorsement completion (content coursework).**

Candidates can pursue an additional endorsement in K-8 reading. Information about this endorsement can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf/>)

Contact an Early Childhood Education academic advisor for additional information.

## Elementary Education

The undergraduate curriculum in elementary education leads to the Bachelor of Science degree. The curriculum in elementary education is designed for candidates preparing to teach at the elementary school level. This program leads to careers in working with school-aged children in kindergarten through sixth grade. Program completers who apply for licensure are recommended for licensure to the Iowa Board of Educational Examiners. Individuals who are licensed will be qualified to teach in elementary classrooms in either public or private schools. Elementary Education majors must complete all of the required degree curriculum. This can be found at: <http://catalog.iastate.edu/collegeofhumansciences/elementaryeducation/>

**Candidates must receive a minimum of a "C" in all education (EDUC), human development and family studies (HD FS), special education (SP ED) courses and all content-specific pedagogy/methods courses required for program completion and endorsement completion.**

**Candidates must receive a minimum of a "C-" in all major department courses/content courses required for teacher program completion and endorsement completion (content coursework).**

In addition to pursuing a degree in Elementary Education, candidates are required to pursue an endorsement in at least one additional area. Candidates will be prepared to teach students in grades kindergarten through eighth grade in this area. Endorsements in the following areas are available for elementary education majors:

- K-8 English/Language Arts & Reading
- K-12 English as a Second Language (ESL)
- K-8 Health
- K-8 Mathematics
- K-8 Science
- K-8 Social studies
- K-8 Special education (Instructional Strategist I: Mild/Moderate Disabilities K-8)

Candidates can pursue additional endorsements in any of the above listed areas and in the following areas:

- K-8 Reading
- K-12 Coaching
- 5-8 Algebra for HS Credit

Information about these additional endorsements can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catyr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catyr2jqf/>) Contact an Elementary Education academic advisor for additional information.

Elementary education majors must satisfy a world languages requirement for graduation. Students must complete two years of a foreign language in high school or one year of a foreign language in college.

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekxax/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## K-12 and Secondary Education

Students wanting to pursue K-12 or Secondary Teacher Education major in the content area in which they want to focus. They then pursue one of two options depending upon their program: 1) complete the secondary major in Education or 2) complete additional coursework required to complete the Educator Preparation Program. Program completers who apply for licensure are recommended to the Iowa Board of Educational Examiners.

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekxax/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must

Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## Secondary Major in Education

A secondary major in Education at Iowa State University prepares candidates to teach at the middle school and high school levels. K-12/Secondary Educator Preparation Programs eligible to pursue the secondary major in Education are:

- English Education
- History/Social Sciences Education - History
- History/Social Sciences Education - Political Science
- Mathematics Education
- Science Education – Biology
- Science Education – Chemistry
- Science Education – Earth Science
- Science Education – Physics
- World Languages and Cultures Education – French
- World Languages and Cultures Education – German
- World Languages and Cultures Education – Spanish

Secondary majors in education must complete all of the required degree curriculum. This can be found at: <http://www.catalog.iastate.edu/collegeofhumansciences/educationsecondary/>

## Additional Endorsements and Minors

Candidates pursuing the secondary major in Education have the opportunity to pursue additional endorsements and minors:

- K-12 Coaching Endorsement
- K-12 English as a Second Language Endorsement
- 5-12 Reading Endorsement
- Additional Science Endorsements
  - 5-12 Basic Science
- Additional Social Sciences Endorsements
  - 5-12 American Government
  - 5-12 Anthropology
  - 5-12 Economics
  - 5-12 Psychology
  - 5-12 Sociology
- 5-12 Speech and Theatre Endorsement

(See <https://education.iastate.edu/future-students/find-your-major/endorsements/> for additional information)

- Learning Technologies Minor

(See <https://education.iastate.edu/find-your-major/learning-technologies-minor/>)

Specific program requirements can be found within each department that houses the endorsement. Information on K-12 Coaching, K-12 English as a Second Language, and 5-12 Reading can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf/>)

## Curriculum in secondary major in Education

### Educator Preparation Program Admission Requirements

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekkax/>)

In order to be eligible to student teaching (EDUC 417), candidates must have completed all degree program requirements and content specific coursework.

- Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer.

Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

All Educator Preparation Program candidates must complete the professional core coursework (information found under each program) and required pedagogy and field experience coursework for their program. In addition, all prospective teachers are required to meet general education requirements as a part of their preparation. They must complete studies in the following general education groups. General education courses may be found in many departments. Credits listed are minimum requirements. Specific departments and/or colleges may

require specific coursework to meet these requirements or additional credits. Credits used to satisfy these general education requirements typically satisfy department and college general education requirements.

### **Educator Preparation General Education Requirements**

- Natural Sciences: 6 credits
- Mathematics or Statistics: 3 credits
- Social Sciences: 9 credits
- Humanities: 6 credits
- Communication Skills: 9 credits that must include ENGL 150 and 250 or an equivalent
- Library Skills: LIB 160 for 1 credit
- Other:
  - HD FS 102 or PSYCH 230
  - One course in American history or government
  - One course that develops interpersonal or group presentation skills

NOTE: Specific majors will provide approved options to meet these requirements.

### **Secondary major in Education Requirements for English Education Candidates**

#### **Educator Preparation Field Experiences:**

EDUC 280L Pre-Student Teaching Experience I: Secondary Education – 0.5 credits

EDUC 380A Pre-Student Teaching Experience II: Core Experience – 2 credits

EDUC 480 Pre-Student Teaching Experience III – 2 credits

ENGL 417E Student Teaching: English and Literature – 16 credit

#### **Educator Preparation Professional Core Coursework:**

EDUC 202 Educational Technologies in the 7-12 Classroom – 3 credit

EDUC 204 Social Foundations of Education in the United States:

Secondary – 3 credits

EDUC 333 Educational Psychology – 3 credits

EDUC 395 Teaching Disciplinary Literacy – 3 credits

EDUC 406 Social Justice Education and Teaching: Secondary – 3 credits

SP ED 401 Teaching Secondary Students with Exceptionalities in General Education – 3 credits

#### **Educator Preparation Pedagogy/Methods Coursework:**

ENGL 396 Teaching the Reading of Young Adult Literature – 3 credits

ENGL 397 Practice and Theory of Teaching Writing in the Secondary Schools – 3 credits

ENGL 494 Practice and Theory of Teaching Literature in the Secondary Schools – 3 credits

EDUC 426 Principles of Secondary Education – 3 credits

**Please check departmental information in regards to specific content coursework requirements.**

### **Secondary major in Education Requirements for History/Social Sciences Education Candidates**

#### **Educator Preparation Orientation Course Requirement:**

EDUC 219 Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors – 1 credit

#### **Educator Preparation Field Experiences:**

EDUC 280L Pre-Student Teaching Experience I: Secondary Education – 0.5 credits

EDUC 380A Pre-Student Teaching Experience II: Core Experience – 2 credits

EDUC 480 Pre-Student Teaching Experience III – 2 credits

EDUC 417 Student Teaching – 16 credits

#### **Educator Preparation Professional Core Coursework:**

EDUC 202 Educational Technologies in the 7-12 Classroom – 3 credit

EDUC 204 Social Foundations of Education in the United States:

Secondary – 3 credits

EDUC 333 Educational Psychology – 3 credits

EDUC 395 Teaching Disciplinary Literacy – 3 credits

EDUC 406 Social Justice Education and Teaching: Secondary – 3 credits

SP ED 401 Teaching Secondary Students with Exceptionalities in General Education – 3 credits

#### **Educator Preparation Pedagogy/Methods Coursework:**

EDUC 498 Methods of Teaching History/Social Sciences – 3 credits

EDUC 426 Principles of Secondary Education – 3 credits

**Please check departmental information in regards to specific content coursework requirements.**

### **Secondary major in Education Requirements for Mathematics Education Candidates**

#### **Educator Preparation Orientation Course Requirement:**

EDUC 219 Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors – 1 credit

#### **Educator Preparation Field Experiences:**

EDUC 280L Pre-Student Teaching Experience I: Secondary Education – 0.5 credit

EDUC 380A Pre-Student Teaching Experience II: Core Experience – 2 credits

EDUC 480 Pre-Student Teaching Experience III – 2 credits

EDUC 417 Student Teaching – 16 credits

#### **Educator Preparation Professional Core Coursework:**

EDUC 202 Educational Technologies in the 7-12 Classroom – 3 credit

EDUC 204 Social Foundations of Education in the United States:

Secondary – 3 credits

EDUC 333 Educational Psychology – 3 credits

EDUC 395 Teaching Disciplinary Literacy – 3 credits

EDUC 406 Social Justice Education and Teaching: Secondary – 3 credits



SP ED 401 Teaching Secondary Students with Exceptionalities in General Education – 3 credits

**Educator Preparation Pedagogy/Methods Coursework:**

EDUC 497 Teaching Secondary School Mathematics – 3 credits

**Please check departmental information in regards to specific content coursework requirements.**

**Secondary major in Education Requirements for Science Education Candidates (Biology, Chemistry, Earth Science, Physics)**

**Educator Preparation Orientation Course Requirement:**

EDUC 219 Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors – 1 credit

**Educator Preparation Field Experiences:**

EDUC 280L Pre-Student Teaching Experience I: Secondary Education – 0.5 credits

EDUC 380A Pre-Student Teaching Experience II: Core Experience – 2 credits

EDUC 480 Pre-Student Teaching Experience III – 2 credits

EDUC 417 Student Teaching – 16 credits

**Educator Preparation Professional Core Coursework:**

EDUC 202 Educational Technologies in the 7-12 Classroom – 3 credit

EDUC 204 Social Foundations of Education in the United States:

Secondary – 3 credits

EDUC 333 Educational Psychology – 3 credits

EDUC 395 Teaching Disciplinary Literacy – 3 credits

EDUC 406 Social Justice Education and Teaching: Secondary – 3 credits

SP ED 401 Teaching Secondary Students with Exceptionalities in General Education – 3 credits

**Educator Preparation Pedagogy/Methods Coursework:**

EDUC 418 Secondary Science Methods I – 3 credits

EDUC 419 Secondary Science Methods II – 3 credits

**Please check departmental information in regards to specific content coursework requirements.**

**Secondary major in Education Requirements for World Languages and Cultures Education Candidates (French, German, Spanish)**

**Educator Preparation Orientation Course Requirement:**

EDUC 219 Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors – 1 credit

**Educator Preparation Field Experiences:**

EDUC 280L Pre-Student Teaching Experience I: Secondary Education – 0.5 credits

EDUC 380A Pre-Student Teaching Experience II: Core Experience – 2 credits

EDUC 480 Pre-Student Teaching Experience III – 2 credits

EDUC 417 Student Teaching – 16 credits

**Educator Preparation Professional Core Coursework:**

EDUC 202 Educational Technologies in the 7-12 Classroom – 3 credit

EDUC 204 Social Foundations of Education in the United States:

Secondary – 3 credits

EDUC 333 Educational Psychology – 3 credits

EDUC 395 Teaching Disciplinary Literacy – 3 credits

EDUC 406 Social Justice Education and Teaching: Secondary – 3 credits

SP ED 401 Teaching Secondary Students with Exceptionalities in General Education – 3 credits

**Educator Preparation Pedagogy/Methods Coursework:**

ENGL 318 Introduction to ESL methods and materials – 3 credits

EDUC 426 Principles of Secondary Education – 3 credits

**Please check departmental information in regards to specific content coursework requirements.**

It is our expectation that students know the requirements of their academic program and develop and follow an academic plan based on their academic catalog and degree audit using their individual academic adviser as a resource in this process.

**Candidates Pursuing Educator Preparation: Non-secondary major programs**

Iowa State offers the following undergraduate K-12/secondary Educator Preparation Programs not associated with this secondary major:

K-12 Music Education

K-12 Physical Education Teacher Education

Agriculture Education

Family and Consumer Sciences Education

For additional information on these programs please see: <https://education.iastate.edu/find-your-major/secondary-education-middle-or-high-school/>

K-12 and secondary education candidates must complete a professional core course sequence. In general, the sequence includes:

EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 204	Social Foundations of Education in the United States: Secondary	3
EDUC 333	Educational Psychology	3
EDUC 406	Social Justice Education and Teaching: Secondary	3
EDUC 426	Principles of Secondary Education	3
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3
<b>Total Credits</b>		<b>18</b>

Coursework in content-specific pedagogy and field experience coursework also needs to be successfully completed.

**Please check departmental information in regards to specific requirements for each program.**

Candidates can choose to pursue additional endorsements.

- K-12 Coaching
- K-12 English as a Second Language
- 5-12 Agriscience/Agribusiness
- 5-12 Multi-occupations
- 5-12 Reading (contact the English Education academic advisor for a list of required courses)
- Science
  - 5-12 Basic Science
- Social Sciences
  - 5-12 American Government
  - 5-12 Anthropology
  - 5-12 Economics
  - 5-12 Psychology
  - 5-12 Sociology
- 5-12 Speech Communications and Theater

Specific program requirements can be found within each department that houses the endorsement. Information on K-12 Coaching, K-12 English as a Second Language, and 5-12 Reading can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmibz5dhv9catryr2jqf/>)

## LEARNING TECHNOLOGIES MINOR

The School of Education offers a Learning Technologies minor available to all teacher education candidates. In order to earn this minor, candidates must register for the minor and complete the following sequences of courses:

EDUC 201	Educational Technologies in the PK-6 Classroom	3
EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 280B	Pre-Student Teaching Experience I: Educational Technologies	1
EDUC 302	Principles and Practices of Learning with Technology	3
EDUC 407	Online Education in Pre-K-12 Classrooms: Hybrid, Virtual, and Blended Approaches	3
EDUC 454	Emerging Topics in Educational Technologies (take for a total of 3 credits)	3
One of the following:		3
COM S 107	Windows Application Programming	3
COM S 207	Fundamentals of Computer Programming	3
EDUC 370	Toying with Technology	3

**Candidates must receive a "C" or above in all courses**

Additional information can be found at: <https://www.education.iastate.edu/find-majors/learning-technologies-minor/>

## Graduate Study

The School of Education is comprised of two graduate divisions: Higher Education and Teaching, Learning, Leadership, and Policy (TLLP). Within these divisions, the School offers coursework and experiences for the degrees Doctor of Philosophy, Doctor of Education, Master of Science, and Master of Education with a major in education. Students can pursue graduate programs, including a Master of Arts in Teaching degree, leading to completion of a teacher preparation program and recommendation for teacher licensure are offered in secondary science and secondary mathematics. In addition, endorsements in reading and special education can also be pursued by graduate students. Graduate students interested in educational leadership may also participate in our educator preparation programs in educational leadership. Program completers may be recommended for administrative licensure for roles as principals and superintendents. The School of Education offers graduate coursework leading to a minor for masters and doctoral students in other fields of study. Several graduate certificate programs are offered through the School of Education.

## Doctoral Degree Programs

The School of Education offers two doctoral degree programs: the Ph.D. and the Ed.D. Students pursuing a Ph.D. in the division of Higher Education may earn an education degree with an emphasis in higher education administration. Students pursuing a Ph.D. in the division of TLLP may earn an education degree with an emphasis in one of the following areas: educational leadership, organizations, and policy; instructional technology; mathematics education; science education; literacy; special education; or social and cultural studies of education. Specific information about the requirements of and options available within the Ph.D. degree in education are available from the School office or on the School of Education Graduate Programs (<https://www.education.iastate.edu/graduate-programs/>) website.

Graduates of the Ph.D. program in education are prepared to pursue careers as scholars, leaders, and administrators in various educational settings, including public and private colleges and universities, community colleges, public and private educational agencies, non-profits, and corporate training settings.

Students in the School of Education may complete an Education Doctorate (Ed.D.) with a major in education. Students may earn an education degree with an emphasis in Community College Leadership or in P-12 Systems Level Leadership. Specific information about the requirements of the Ed.D. degree in education are available on the School of Education Graduate Programs website. Graduates of the Ed.D. program in education are prepared to pursue careers as scholar-practitioners in leadership roles in community colleges and K-12 educational systems including school districts, public and private education agencies, and state departments of education. Students who complete the K-12

Systems Level Leadership program can be recommended for Iowa licensure as a school superintendent.

## Master's Degree Programs

The School of Education offers two master's degrees: the Master of Science and the Master of Education. In the division of Higher Education, students may earn an M.Ed in education with an emphasis in either student affairs or higher education. In the division of TLLP, students may earn an M.S. or an M.Ed. in education with an emphasis in one of the following areas: educational leadership, organizations and policy; instructional technology; mathematics education; science education; literacy; special education; or social and cultural studies of education.

Specific information about the requirements of and options available within M.S. or M.Ed. degrees in education are available from the School office or on the website School of Education Graduate Programs website <https://www.education.iastate.edu/graduate-programs/>

Graduates of the master's degree programs are prepared to pursue careers as educational leaders, higher education professionals, researchers, and advanced practitioners in colleges and universities, community colleges, public and private schools, education agencies, and informal (free-choice) education settings. Students who complete the M.Ed. in Educational Administration can be recommended for Iowa licensure as a P-12 school principal.

Other graduate programs related to education (including Interdisciplinary Graduate Studies) may be planned for students on the basis of previous education and experiences as well as future plans and needs. For more information, students should refer to Agricultural Education and Studies, Family and Consumer Sciences Education, Kinesiology, and Interdisciplinary Graduate Studies or to graduate level course offerings within other departments.

## Graduate minor in education

A minor in Education is available at both the master's and doctoral level. Graduate students in other majors may pursue a graduate minor in Education. A minor for doctoral students requires 15 credits in education courses, while a minor for master's students requires 9 credits. Students should identify a faculty member who will serve as the minor representative on their Program of Study Committee and work with this person to identify an appropriate set of courses to fit the student's interests. The minor is not an appropriate option for students whose primary interests are in research methodology; the graduate certification Applied Research in the Human Sciences should be used instead. Doctoral students are reminded that a minor must be declared before the preliminary oral examination.

## Graduate Teacher and Educational Leadership Preparation Programs

The School of Education offers a Masters of Arts in Teaching - Science Education and a Masters of Arts in Teaching - Mathematics Education for candidates who currently have a bachelor's degree in a science area (or a closely related field) or in mathematics (or a closely related field), respectively. In addition, the School of Education offers a Masters of Arts in Teaching - Secondary Education that is currently available for individuals with an English degree or a history/social sciences degree interested in becoming a teacher. In these teacher preparation programs, program completers who apply for licensure are recommended for teacher licensure to the Iowa Board of Educational Examiners.

Teacher preparation programs at the graduate level are also offered in Agricultural Education (College of Agriculture and Life Sciences) and Physical Education (College of Human Sciences). The School of Education provides the professional core education coursework for these programs. Students in a graduate teacher preparation program must complete specific courses. Specific information about these programs can be found by contacting these departments.

Graduate level programs leading to recommendation for teaching endorsements, including Reading endorsements and Instructional Strategist II: Behavior Disorders/Learning Disabilities, are offered through the School of Education.

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy:

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphappmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

Graduate students who seek a teaching endorsement in reading or special education, but do not wish to pursue a master's degree

can incorporate those courses in a professional certificate program. Endorsement programs include Instructional Strategist II: Behavior Disorders/Learning Disabilities, Reading K-8 and Reading 5-12. Information about these endorsements can be found at: <https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf/>)

The School of Education offers graduate programs for students seeking careers as principals and superintendents. The Transformative School Leader Program (TSLP) is designed for working professionals and includes coursework and field experiences in a principal preparation program.

Candidates must complete the program as a Master of Education degree.

The Ed.D. in Education with an emphasis in P-12 systems-level leadership is designed for working professionals and includes coursework and field experiences in a superintendent preparation program.

Program completers who apply for licensure are recommended for licensure to the Iowa Board of Educational Examiners.

## Graduate Certificate Programs

The School of Education offers Graduate Certificate programs to allow students to enhance their skills outside of full degree programs.

The Certificate programs currently offered include Applied Research Methods in the Human Sciences, Instructional Design, Literacy Coaching, Education for Social Justice and Special Education. Certificate programs require a minimum of 12 graduate credits (several require more than this) and can be earned in conjunction with a degree program. More information about graduate certificate programs can be found on the School of Education web site.

### Courses:

Education (EDUC)  
Educational Administration (EDADM)  
Educational Leadership and Policy Studies (EL PS)  
Higher Education (HG ED)  
Human Sciences (H SCI)  
Research and Evaluation (RESEV)  
Special Education (SP ED)

## Educator Preparation Program at Iowa State University

Educator Preparation (<http://www.education.iastate.edu/educator-prep-program/>): <https://education.iastate.edu/current-students/educator-preparation-program/>

The Educator Preparation Program at Iowa State University is a shared responsibility that spans three colleges. All candidates who are

recommended by Iowa State University for licensure must be considered a program completer by meeting the requirements of the Educator Preparation Program and be recommended by their department, college, and the ISU recommending official. Students who successfully complete the requirements for any of the endorsement areas offered at ISU must demonstrate the skills, knowledge, and dispositions / professional practices required of educators.

## Undergraduate Educator Preparation Programs

An undergraduate student seeking a bachelor's degree must be enrolled in the department in which he or she plans to major and must meet the graduation requirements of that department and college.

All Educator Preparation Program candidates must complete the professional core coursework (information found under each program) and required pedagogy and field experience coursework for their program. In addition, all prospective teachers are required to meet general education requirements as a part of their preparation. They must complete studies in the following general education groups. General education courses may be found in many departments. Credits listed are minimum requirements. Specific departments and/or colleges may require specific coursework to meet these requirements or additional credits. Credits used to satisfy these general education requirements typically satisfy department and college general education requirements.

For Educator Preparation general education requirements, please visit the School of Education website: <https://education.iastate.edu/current-students/educator-preparation-program/resources/curriculum-requirements/>

Currently, there are fifteen undergraduate Educator Preparation areas offered at Iowa State University. These areas and their corresponding grade levels are listed below:

Agricultural Education (grades 5-12)  
Biology (grades 5-12)  
Chemistry (grades 5-12)  
Early Childhood Education-Unified (birth-grade 3, inclusive)  
Earth Science (grades 5-12)  
Elementary Education (grades K-6)  
English (grades 5-12)  
Family and Consumer Sciences (grades 5-12)  
Health Education (grades 5-12)  
History-Social Sciences (grades 5-12)  
Mathematics (grades 5-12)  
Music (grades K-12)  
Physical Education (grades K-12)  
Physics (grades 5-12)

World Languages and Cultures (French, German, and Spanish) (grades 5-12)

## Endorsements Areas

### *Early Childhood Education*

Candidates can also choose to pursue an endorsement in K-8 reading.

### *Elementary Education*

Candidates pursuing a degree in Elementary Education are required to pursue an endorsement in at least one additional area. Endorsements in the following areas are available for elementary education majors:

- K-8 English/Language Arts & Reading
- K-12 English as a Second Language (ESL)
- K-8 Health
- K-8 Mathematics
- K-8 Science
- K-8 Social studies
- K-8 Special education (Instructional Strategist I: Mild/Moderate Disabilities K-8).

Additional information about these endorsements can be found at:  
<https://www.education.iastate.edu/find-majors/elementary-education/>

Elementary Education Candidates can pursue additional endorsements in any of the above listed areas and in the following areas:

- K-8 Reading
- K-12 Coaching
- 5-8 Algebra for HS Credit

Information about these additional endorsements can be found at:  
<https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf>  
 (https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf/)

Contact an Elementary Education academic advisor for the requirements for these endorsements.

### *K-12 Education and Secondary Education*

Candidates can choose to pursue additional endorsements. These can include any of the above listed endorsement and the following:

- K-12 Coaching
- K-12 English as a Second Language
- 5-12 Agriscience/Agribusiness
- 5-12 Multi-Occupations
- 5-12 Reading (contact the English Education academic advisor for a list of required courses)
- Science

- 5-12 Basic Science
- Social Sciences
  - 5-12 American Government
  - 5-12 Anthropology
  - 5-12 Economics
  - 5-12 Psychology
  - 5-12 Sociology
- 5-12 Speech Communications and Theater
- World Languages and Cultures
  - 5-12 Chinese
  - 5-12 Russian

Information about endorsements can be found at: <https://education.iastate.edu/future-students/find-your-major/endorsements/>

## Minors

Students in the Educator Preparation Program may also choose to pursue a minor in Learning Technologies. Additional information can be found at: <https://www.education.iastate.edu/find-majors/learning-technologies-minor/>

## Post-Bachelor's Educator Preparation Programs

Students holding an appropriate bachelor's degree may complete the K-12 or secondary educator preparation program in order to be recommended for teacher licensure.

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehixe12epxtekxax/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3



- Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

Candidates would be required to complete the Professional Core requirements of the program. In general, the sequence includes:

EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 204	Social Foundations of Education in the United States: Secondary	3
EDUC 333	Educational Psychology	3
EDUC 406	Social Justice Education and Teaching: Secondary	3
EDUC 426	Principles of Secondary Education	3
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3
<b>Total Credits</b>		<b>18</b>

Coursework in content-specific pedagogy and field experience coursework also need to be successfully completed. Please check department information regarding to specific requirements for each program.

Candidates must have at least one course in each of the following five general education groups identified for undergraduate students identified in the previous section: Natural Sciences, Mathematics and Statistics, Social Sciences, Humanities, and Communication Skills. Specific departments and/or colleges may require specific coursework to meet these requirements or additional credits.

Interested students should consult with the program coordinator of the area in which they plan to specialize so that an individualized program of study can be developed.

Educator Preparation Programs for which post-bachelor candidates take undergraduate Educator Preparation courses include;

English (grades 5-12)  
 Health Education (grades 5-12)  
 History-Social Sciences (grades 5-12)  
 World Languages and Cultures (French, German, and Spanish) (grades 5-12)

## GRADUATE DEGREE PROGRAMS WITH EDUCATOR PREPARATION PROGRAM COMPLETION

Currently, there are four graduate teacher-educator preparation programs. These programs are designed for students who do not currently hold a teaching license. The programs are listed below:

Agricultural Education (M.S.)  
 General Education Mathematics Education (M.A.T.)

Physical Education (M.S.)  
 Secondary Science Education (M.A.T.)

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphappmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

Graduate level programs leading to recommendation for additional teaching endorsements are offered through the School of Education. Graduate students who seek a teaching endorsement in reading or special education, but do not wish to pursue a master's degree can incorporate the coursework in a professional certificate program. Endorsement programs include Instructional Strategist II: Behavior Disorders/Learning Disabilities, Reading K-8 and Reading 5-12.

Graduate programs are also available for those who wish to pursue educational leadership as a profession as PK-12 school principals or PK-12 superintendents. (See Educational Leadership and Policy Studies in Courses and Programs section of this catalog.)

## Master's Programs with Teacher Preparation AGRICULTURAL EDUCATION

The Agricultural Education and Studies Department offers a Master's of Science program that prepares Agricultural Education teachers for grades 5-12

See coordinator for program requirements.

## Secondary MATHEMATICS

The School of Education offers a Master's of Education program that prepares Mathematics teachers for grades 5-12



## Physical Education

The Department of Kinesiology offers a Master's of Arts in Teaching program that prepares Physical Education teachers for grades K-12.

## Secondary Education

The School of Education offers a Master's of Arts in Teaching program that prepares secondary teachers for grades 5-12. Currently this program is available for English Education candidates and History/Social Sciences Education candidates.

See coordinator for program requirements.

## Secondary Sciences

The School of Education offers a Master's of Arts in Teaching program that prepares Secondary Science teachers for grades 5-12

See coordinator for program requirements.

# IOWA STATE UNIVERSITY TEACHER EDUCATION STANDARDS (INTASC STANDARDS)

## The Learner and Learning

Standard #1: Learner Development. The teacher understands how learners grow and develop, recognizing that patterns of learning and development vary individually within and across the cognitive, linguistic, social, emotional, and physical areas, and designs and implements developmentally appropriate and challenging learning experiences.

Standard #2: Learning Differences. The teacher uses understanding of individual differences and diverse cultures and communities to ensure inclusive learning environments that enable each learner to meet high standards.

Standard #3: Learning Environments. The teacher works with others to create environments that support individual and collaborative learning, and that encourage positive social interaction, active engagement in learning, and self-motivation.

## Content

Standard #4: Content Knowledge. The teacher understands the central concepts, tools of inquiry, and structures of the discipline(s) he or she teaches and creates learning experiences that make the discipline accessible and meaningful for learners to assure mastery of the content.

Standard #5: Application of Content. The teacher understands how to connect concepts and use differing perspectives to engage learners in critical thinking, creativity, and collaborative problem solving related to authentic local and global issues.

## Instructional Practices

Standard #6: Assessment. The teacher understands and uses multiple methods of assessment to engage learners in their own growth, to monitor learner progress, and to guide the teacher's and learner's decision making.

Standard #7: Planning for Instruction. The teacher plans instruction that supports every student in meeting rigorous learning goals by drawing upon knowledge of content areas, curriculum, cross-disciplinary skills, and pedagogy, as well as knowledge of learners and the community context.

Standard #8: Instructional Strategies. The teacher understands and uses a variety of instructional strategies to encourage learners to develop deep understanding of content areas and their connections, and to build skills to apply knowledge in meaningful ways.

Standard #8A: Technology. The teacher integrates current and emerging technology in instruction to encourage student creativity, problem solving, collaboration, and digital literacy. Teachers practice and advocate safe, legal, and responsible use of information and technology (this standard is unique to the Iowa State University Teacher Preparation Program).

## Professional Responsibility

Standard #9: Professional Learning and Ethical Practice. The teacher engages in ongoing professional learning and uses evidence to continually evaluate his/her practice, particularly the effects of his/her choices and actions on others (learners, families, other professionals, and the community), and adapts practice to meet the needs of each learner.

Standard #10: Leadership and Collaboration. The teacher seeks appropriate leadership roles and opportunities to take responsibility for student learning, to collaborate with learners, families, colleagues, other school professionals, and community members to ensure learner growth, and to advance the profession.

# EDUCATOR PREPARATION PROGRAM ADMISSION REQUIREMENTS

Educator Preparation Program Candidates must have:

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekxax/>)

More information about admission requirements can be found at: <https://www.education.iastate.edu/educator-prep-program/admission/>

## THE PROFESSIONAL CORE REQUIREMENT FOR EDUCATOR PREPARATION

### Undergraduate Students

Educator Preparation Program candidates must complete certain studies related directly to the profession of teaching. All undergraduate candidates in the educator preparation program must take the following courses prior to student teaching, unless the student's program area has an approved content-area course deemed to be equivalent. Candidates must receive a minimum of a "C" in all education (EDUC) / Curriculum Instruction (C I) , Human Development and Family Studies (HD FS), Special Education (SP ED) courses and all content-specific pedagogy/methods courses required for licensure. (See program coordinator for more information).

#### EARLY CHILDHOOD EDUCATION-Unified

EDUC 201	Educational Technologies in the PK-6 Classroom	3
EDUC 205	Social Foundations of Education in the United States: Early Childhood and Elementary Education	3
EDUC 245	Landscape of Teaching	3
EDUC 332	Educational Psychology of Early Childhood and Elementary Education	3
EDUC 405	Social Justice Education and Teaching: Early Childhood and Elementary	3
SP ED 250	Education of the Exceptional Learner	3

**Total Credits** 18

In addition, Early Childhood Education majors must complete all degree curriculum requirements. These can be found here: [http://catalog.iastate.edu/collegeofhumansciences/earlychildhood\\_education/](http://catalog.iastate.edu/collegeofhumansciences/earlychildhood_education/)

#### ELEMENTARY EDUCATION:

EDUC 201	Educational Technologies in the PK-6 Classroom	3
EDUC 205	Social Foundations of Education in the United States: Early Childhood and Elementary Education	3
EDUC 245	Landscape of Teaching	3
HD FS 102 or PSYCH 230	Human Development Developmental Psychology	3
HD FS 240	Literature for Children	3
SP ED 250	Education of the Exceptional Learner	3
EDUC 332	Educational Psychology of Early Childhood and Elementary Education	3

**Total Credits** 21

Elementary Education majors must meet all degree curriculum requirements. These can be found here: <http://www.catalog.iastate.edu/collegeofhumansciences/elementaryeducation/>

#### K-12 AND SECONDARY EDUCATION:

EDUC 202	Educational Technologies in the 7-12 Classroom	3
EDUC 204	Social Foundations of Education in the United States: Secondary	3
EDUC 333	Educational Psychology	3
EDUC 406	Social Justice Education and Teaching: Secondary	3
EDUC 426	Principles of Secondary Education	3
SP ED 401	Teaching Secondary Students with Exceptionalities in General Education	3

In addition, candidates must complete all degree program discipline-specific pedagogy coursework, field experience coursework, and content-specific coursework. These requirements can be found in the home department of the major.

### Post-Bachelor's Students

Students who hold an appropriate bachelor's degree and seek a teaching license must complete an educator preparation program. This includes the professional education requirements listed above. The requirements can be met through course work or examination.

### Master's Students

Prospective teachers must complete certain studies related directly to the profession of teaching. All students enrolled in Master's programs that lead to completion of an educator preparation program must take the following courses prior to student teaching, unless the student's program area has an approved content area course deemed to be equivalent. (See Master's Programs section below for details.)

EDUC 505	Using Technology in Learning and Teaching	3
EDUC 506	Social Justice Education and Teaching: Advanced	3
EDUC 526	Principles of Secondary Education <sup>Not all programs require this course. Check with program coordinator</sup>	3
EDUC 529 or EDUC 521	Educational Psychology and the Secondary Classroom Introduction to the Teaching and Learning of Mathematics and Science	3
EDUC 580	Studies in the Foundations of Education in the United States	3
SP ED 501	Teaching Secondary Students with Exceptionalities in General Education	3

In addition, candidates must complete all degree program discipline-specific pedagogy coursework, field experience coursework, and content-

specific coursework. These requirements can be found in the home department of the major.

## CLINICAL EXPERIENCES

The Standards for Practitioner and Administrator Preparation Programs 281–79.14(256) Teacher preparation clinical practice standard states, "The unit and its school partners shall provide field experiences and student teaching opportunities that assist candidates in becoming successful teachers in accordance with the following provisions."

This includes:

- **79.14(5)** Teacher candidates admitted to a teacher preparation program must complete a minimum of 80 hours of pre-student teaching field experiences, with at least 10 hours occurring prior to acceptance into the program.
- **79.14(7)** The unit is responsible for ensuring that the student teaching experience for initial licensure:

a. Includes a full-time experience for a minimum of 14 consecutive weeks in duration during the teacher candidate's final year of the teacher preparation program. (Iowa State University policy requires a full semester experience.)

For most programs, there are four levels for clinical experiences used to meet these requirements. Level 1 involves observation in local schools and is typically completed prior to admission to the educator preparation program. Level 2 involves actively teaching in the classroom with one-two lessons, at minimum. Level 3 involves actively teaching in the classroom with two lessons, at minimum and being observed by a supervisor during teaching. Level 4 is student teaching and involves actively teaching for a semester-long experience where the student teacher bears primary responsibility for planning and instruction within the classroom for a minimum of four weeks during the semester. Level 2, 3 and 4 field experiences involve a course fee, which ranges from \$75.00 to \$450.00 and are assessed to cover the costs of supervision and placement with a cooperating teacher. Course fees are increased when students teach nationally or internationally. For current course fees, consult the Schedule of Classes. For level 2, 3 and 4 field experiences, the student needs access to transportation because the placement may be within 60 miles of the university. The time commitment for clinical experiences ranges from 1/2 day for level 2 and 3 to the full day for level 4. Students complete a background check before initial placement in schools and other appropriate locations.

Specific field experience course requirements can be found in program/degree requirements.

## PROGRAM CURRICULUM

### Undergraduate Students

#### Early Childhood Education – Unified

The curriculum in Early Childhood Education – Unified prepares graduates to teach young children and work with their families. This program leads to careers working with young children (both those who are typically developing and those with special needs) from birth through third grade, inclusive. Program completers can be recommended for licensure to the Iowa Board of Educational Examiners. Individuals who are licensed may be employed by either public or private agencies or schools to teach in early childhood classrooms (preschool through 3rd grade) or in home-based programs. The program is an interdepartmental major administered by the Department of Human Development and Family Studies and the School of Education. For more information about the program, see Early Childhood Education - Unified Curriculum <http://www.education.iastate.edu/undergraduate-studies/early-childhood-education> (<http://www.education.iastate.edu/undergraduate-studies/early-childhood-education/>). (<https://hdfs.hs.iastate.edu/find-your-major/early-childhood-education/>).

In addition to being admitted Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehixe12epxtekxax/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

All early childhood education – unified candidates must meet general education requirements in order to complete the Educator Preparation Program.

### Elementary Education

In addition to pursuing a degree in Elementary Education, candidates are required to pursue an endorsement in at least one additional area. Candidates will be prepared to teach students in grades kindergarten through eighth grade in this area of specialization. Endorsements in the following areas are available for elementary education majors:

- K-8 English/Language Arts & Reading
- K-12 English as a Second Language (ESL)
- K-8 Health
- K-8 Mathematics
- K-8 Science
- K-8 Social studies
- K-8 Special education (Instructional Strategist I: Mild/Moderate Disabilities K-8)

Additional information about these endorsements can be found at: <https://www.education.iastate.edu/find-majors/elementary-education/>

Candidates can pursue additional endorsements in any of the above listed areas and in the following areas:

- K-8 Reading
- K-12 Coaching

Information about these additional endorsements can be found: <https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf/> (<https://iastate.app.box.com/s/m4tr3ogr9ouwmiubz5dhv9catryr2jqf/>)

Contact an Elementary Education academic advisor for additional information.

Elementary education majors must satisfy a world languages requirement for graduation. Students must complete two years of a foreign language in high school or one year of a foreign language in college.

In addition to being admitted to Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekxax/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered

an educator preparation program completer. Decision Point 3

- Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## K-12 and Secondary Education

Students wanting to pursue K-12 or Secondary Teacher Education declare a major in the content area in which they want to focus.

They then pursue one of two options depending upon their program: 1) complete the secondary major in Education or 2) complete additional coursework required to complete the Educator Preparation Program.

K-12/Secondary Educator Preparation Programs eligible to pursue the secondary major in Education are:

- English Education
- History/Social Sciences Education
- Mathematics Education
- Science Education – Biology
- Science Education – Chemistry
- Science Education – Earth Science
- Science Education – Physics
- World Languages and Cultures Education – French
- World Languages and Cultures Education – German
- World Languages and Cultures Education – Spanish

Iowa State offers the following undergraduate K-12/secondary Educator Preparation Programs not associated with this secondary major:

- K-12 Music Education
- K-12 Physical Education Teacher Education
- Agriculture Education
- Family and Consumer Sciences Education

In addition to being admitted Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)
- Decision Point 1 - Early Admission to the Educator Preparation Program for Transfer Students (<https://iastate.box.com/s/r3ap8wej7m3bmd0cehix12epxtekxax/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must

Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## Post-Bachelor's Students

Students holding an appropriate bachelor's degree who wish to complete a teacher preparation program in order to pursue teacher licensure must have at least one course in each of the following five general education groups identified for undergraduate students in the preceding section: Natural Sciences, Mathematics or Statistics, Social Sciences, Humanities, and Communication Skills. Individual departments preparing teachers may require additional credits in general education. (See program coordinator for more information).

In addition to being admitted Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates but have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## Graduate Students

Each Master's program will determine what, if any, general education requirements Master's students must fulfill beyond a bachelor's degree from a regionally accredited institution. (See program coordinator for more information.)

In addition to being admitted Iowa State University and departmental programs/majors, educator preparation candidates must be admitted to the Educator Preparation Program prior to beginning advanced coursework.

Educator Preparation Program Admission Requirements are provided in Educator Preparation Policy.

- Decision Point 1 - Admission to the Educator Preparation Program (<https://iastate.box.com/s/n8eewbs3fznazf8alerv0qbf216fno7e/>)

In order to be eligible for student teaching, candidates must have completed all degree program requirements and specific coursework. Decision Point 2 - Requirements Students Must Meet Prior to Student Teaching (<https://iastate.box.com/s/hewm5y0era2j76cdvllaphppmsg43cs/>)

In order to be recommended for licensure, candidates but have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

See coordinator for program requirements.

## EDUCATOR PREPARATION PROGRAM COMPLETION REQUIREMENTS

In order to be recommended for licensure to the Iowa Board of Educational Examiners by Iowa State University, candidates must have completed all degree program requirements and be considered an educator preparation program completer. Decision Point 3 - Recommendation for Licensure (<https://iastate.box.com/s/tvfae96b3b1y87wbyfna2oonhmfoba7g/>)

## REGENTS ALTERNATIVE PATHWAY TO IOWA LICENSURE

The Regents Alternative Pathway to Iowa Licensure is a collaborative program involving the three Iowa Regents' universities. The program is designed for adult learners holding a baccalaureate degree with work experience who are seeking 5-12 licensure. For more information: <https://iowateacherintern.org>

## Youth Development Interinstitutional Graduate Program

Iowa State University offers a Master's degree in Family and Consumer Sciences with a specialization in Youth Development. This is an interinstitutional online program offered through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the degree. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions: Michigan State University, North Dakota State University, Texas Tech University, University of Missouri, and University of Nebraska-Lincoln.



### The Master of Family and Consumer Sciences with Youth

**Development specialization** is an online degree available focusing on developing knowledge and skills to serve today's youth. Students become immersed in a strengths-based curriculum and learn a methodology that supports youth, enabling them to grow socially, emotionally, and cognitively. The program has its roots in positive youth development. Rather than focusing solely on corrective measures, a positive youth development approach equips individuals in the second decade of life with the skillset necessary for a successful transition into adulthood.

The masters degree consists of 36 credits, 27 required credits, 6 elective credits, and 3 or more credits of creative component and/or internship (<https://online.hs.iastate.edu/graduate-degrees/youth-development/>). This program does not require a thesis.

## Youth Development Certificates

The Youth Development certificates (<https://online.hs.iastate.edu/graduate-degrees/youth-development/>) are offered completely online through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the certificate. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions: Michigan State University, North Dakota State University, Texas Tech University, University of Missouri, and University of Nebraska-Lincoln. Both are stand-alone graduate certificates available to any student with a bachelor's degree.

- 12-credit Youth Development Specialist Graduate Certificate
- 12-credit Youth Program Management and Evaluation Graduate Certificate

### Courses primarily for graduate students, open to qualified undergraduates:

#### YTH 502: Foundations of Positive Youth Development

Cr. 3. Repeatable. F.S.SS.

Fundamentals of positive youth development, theories, and principles utilized in the youth development profession. Ethical, professional, and historical elements of youth development as it has evolved toward professionalization.

#### YTH 510: Adolescents and Their Families

(3-0) Cr. 3. F.S.

Adolescent development as it is related to and intertwined with family development; reciprocal influences between adolescents and their families are examined. Working with youth vis à vis the family system will be highlighted.

#### YTH 520: Positive Youth Development in Community Settings

(3-0) Cr. 3. F.S.

Focus on the national emphasis of a strength-based or asset approach to community youth development, encompassing individual development (i.e., positive youth development) and adolescent interrelationships with environments. Emphasis is placed upon research, theory, and practice applied in communities throughout the U.S. Students will explore existing models, read theoretical and applied literature, and examine current community efforts as a basis for understanding community youth development.

#### YTH 530: Youth in Cultural Contexts

(3-0) Cr. 3. F.S.

Examination of the cultural context factors that affect youth from a holistic perspective within and outside the family unit. The course will provide an understanding of the cultural heritage of differing family structures and types. Students will explore the social and educational processes experienced by youth through in-depth reading, writing, discussion, critical listening, viewing of contemporary videos, and informal interviews with youth. Students will be encouraged to think critically about society and culture, gain further knowledge of how ethnic groups fit historically into society, and examine the results of how history has shaped the current cultural climate of the U.S.

#### YTH 540: Youth Professionals as Consumers of Research

(3-0) Cr. 3. F.S.

This course will help youth development professionals understand and evaluate research reports to reduce anxiety about applying research results and theories to practice. Specific emphasis will be on research and theory reports related to youth development.

#### YTH 550: Youth Policy

(3-0) Cr. 3. F.S.

Various federal and state policies designed specifically for youth. Students will examine how and why policies for youth are constructed. A guiding question that will be used to evaluate existing state and national policies is whether they contribute to, or act as, barriers to desired developmental outcomes.

#### YTH 560: Youth-Adult Relationships

Cr. 3. Repeatable. F.S.

The role of youth-adult relationships in promoting the positive development of youth. Attitudes and activities that support youth engagement and agency. Research and practice of mentorship, youth-adult partnerships, and youth leadership.



**YTH 570: Contemporary Youth Issues**

(3-0) Cr. 3. Repeatable. F.S.SS.

Issues faced by youth today and associated risk and resiliency factors. A different topic will be presented each year, with the course rotating among participating universities. Past topics have included Youth Violence, Youth and Appearance, Adolescent Health, Global Perspectives and Volunteerism. The course may be taken more than once, as long as the content is different each time.

**YTH 570L: Contemporary Youth Issues: Mental Health**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Understand optimal mental health in youth and how it can be promoted. Current theories and research related to optimal mental health and how promoting positive development is both similar to and different from preventing negative outcomes. Learn to assess a given youth development program in terms of its potential to promote positive mental health.

**YTH 570M: Contemporary Youth Issues: Working with Adolescents with Difficulties**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Examines cognitive, self, and social transitions during adolescence. Topics include issues of identity, society's understanding of adolescents, and how adolescents and their parents, siblings, peers, teachers, and society interact.

**YTH 570N: Contemporary Youth Issues: Understanding Normative Behavior in Immigrant & Minority Youth**

Cr. 3. Repeatable. F.

Explores the etiology of adolescent deviance using a positive, cross-national/crosscultural perspective. Includes implications of theory, empirical research, current prevention programs and needs assessments. Offers a look at deviance from different perspectives as well as a comparison of normative and non-normative development of youth.

**YTH 570P: Contemporary Youth Issues: Youth, Families & Technology**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Understand the interconnectedness of technology and youth/family. Formulate constructive and realistic strategies to enrich the life of a family or a youth in a society heavily dependent on technology. Topics of the course include identity formation, privacy, race, class, gender, subculture, risky behavior, policing, education, globalization, health, and policies.

**YTH 570R: Contemporary Youth Issues: Sports, Youth and Society**

Cr. 3. Repeatable. Alt. SS., offered even-numbered years.

Examination of how sports and society helps us better understand what we value, how we become who we are, and how we may be able to realize social justice in a larger social context.

**YTH 580: Youth Development Personnel and Program Management**

(3-0) Cr. 3. F.S.

Introduction to the development, administration and management of youth-serving organizations.

**YTH 585: Design and Evaluation of Youth Programs**

(3-0) Cr. 3. F.S.

Theoretical, methodological, and pragmatic issues involved in conducting programs and scholarship. Overview of the program development process and outcome evaluation of children and family programs. Modes of outcome scholarship and their implications for community-based programs are discussed. Students will develop knowledge through participating in a community-based project involving the practical application of program design and evaluation methods.

**YTH 589: Grant Development and Management.**

Cr. 3.

Grant-getting process and an overview of what happens after a project is funded. The following topics will be covered: researching funding sources, generating cutting edge ideas, assessing needs, planning a project, establishing credibility, formulating a sustainable budget, designing an evaluation plan, managing the funded project, and disseminating project results.

**YTH 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

Nonthesis students creative component (e.g., a special report, capstone course, integrated field experience, annotated bibliography, research project, design, or other creative endeavor). A minimum of five credits of independent work is required on the programs of study (POS). Creative component format determined cooperation with the POS committee. Offered on a satisfactory-fail basis only.

**Courses for graduate students:****YTH 634: Youth Development**

(3-0) Cr. 3. F.S.

Introduction to the developmental period of adolescence. The theory and research of positive youth development will be the lens through which this developmental period is examined. The course will emphasize how the developmental tasks of this life stage are influenced by (and influence) family and home, school, peers, and other contextual forces. The course will help students recognize and become familiar with the major issues and transitions adolescents face as they successfully navigate this developmental stage by critically examining the theoretical and research literature.

**YTH 690: Advanced Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor.*

Advanced topics.

**YTH 691: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor.*

Supervised practice and experience in college teaching, research, professional experience. Offered on a satisfactory-fail basis only.

# COLLEGE OF LIBERAL ARTS AND SCIENCES

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**Beate Schmittmann**, Dean

**Monic Behnken**, Associate Dean

**Arne Hallam**, Associate Dean

**Leslie Hogben**, Associate Dean

**Kent Kerby**, Assistant Dean

**Jo Anne Powell-Coffman**, Associate Dean

**Amy Slagell**, Associate Dean

**Zora D. Zimmerman**, Associate Dean Emerita

[www.las.iastate.edu/](http://www.las.iastate.edu/) (<http://www.las.iastate.edu/>)

The College of Liberal Arts and Sciences (LAS) is a world-class learning and research community. Iowa State's most academically diverse college, LAS educates students to become global citizens, providing rigorous academic programs in the sciences, humanities and social sciences within a supportive, student-centered learning environment that emphasizes career readiness. The college also is home to the Open Option Program that prepares students for any curriculum at the University.

## Learning Goals

The primary mission of the college is to promote learning in all its dimensions by providing students with ample opportunities to acquire the requisite knowledge, abilities, and skills to succeed in the world beyond the university. Through coursework within the major and in general education, students will develop skills in reasoning, analysis, and communication; achieve an understanding of the intellectual, historical, and artistic foundations of culture; and work to strengthen their abilities to interact with people, cultures, and the environment in an ethical and sensitive manner. To achieve these learning goals, the college asks students to acquire depth in learning within disciplines of their own choosing, and to acquire breadth through general education courses and electives. The breadth and depth requirements of our liberal arts and sciences degree programs prepare students for a lifetime of evolving career opportunities.

The College of Liberal Arts and Sciences offers over forty majors. Students can earn Bachelor of Arts, Bachelor of Science, Bachelor of Music, or Bachelor of Liberal Studies degrees. In collaboration with the College of Engineering, the College of Liberal Arts and Sciences also participates in a program of study leading to the Bachelor of Science in Software Engineering.

## Preparation for Entering the College of Liberal Arts and Sciences

Students entering the college are expected to have high school preparation with at least 4 years of English, 3 years each of Social Studies, Mathematics and Science. Students are also encouraged to have coursework in computer applications. The study of a world language is highly encouraged; three or more years of a single world language in high school meets the world language graduation requirement in the College of Liberal Arts and Sciences.

Students often enter the College of Liberal Arts and Sciences as transfer students. Prospective transfer students are urged to contact the College of Liberal Arts and Sciences well before arriving on campus so that pre-transfer courses are appropriate to the planned major and transferable toward graduation from ISU. Early planning can improve the transfer process and support a timely graduation. Details regarding the criteria for graduation with distinction and other academic honors are available under Scholastic Recognition.

For information on articulation/transfer agreements that apply to students who have earned Associate of Arts degrees from an Iowa public community college or who have satisfied general education requirements at the University of Northern Iowa or in the College of Liberal Arts at the University of Iowa, see Articulation/Transfer Agreements in the Admission Transfer Information section of the catalog.

Transfer students in the College of Liberal Arts and Sciences may choose to graduate under the catalog in effect at the time of their graduation or under one of the five immediately preceding catalogs, provided that it covers the period of their enrollment either at Iowa State or any other accredited school. Full requirements of the chosen catalog must be met though adjustments will be made in instances where courses are no longer available or where programs have been changed. Transfer students are responsible for reviewing their transfer credit evaluation with the academic advisor during the first semester of enrollment.

## Academic Advising

Each student in the College of Liberal Arts and Sciences is assigned an academic advisor in their area of study. This advisor assists the student in developing a program of study designed to meet the degree requirements while also meeting a student's goals outside of and beyond the classroom by incorporating activities such as study abroad, internships, Honors Program and undergraduate research. Advisors are a first point of contact for referral to university and college resources and services and play a crucial role in student success.

Academic advising begins during orientation programming prior to entry and continues through a student's graduation. Through the process of advising, students will develop academic plans that reflect their unique interests and goals as well as learn about the university resources

available to assist them academically, professionally, and personally.

Advisors help students understand how their interests, skills and goals connect to fields of study and careers, including how a liberal arts education enhances their academic development.

## Departments and Programs of the College

Majors, minors and certificates in the College of Liberal Arts and Sciences are administered by the following departments and programs.

### Departments

- Air Force Aerospace Studies
- Biochemistry, Biophysics, and Molecular Biology
- Chemistry
- Computer Science
- Ecology, Evolution, and Organismal Biology
- Economics
- English
- Genetics, Development, and Cellular Biology
- Geological and Atmospheric Sciences
- Greenlee School of Journalism and Communication
- History
- Mathematics
- Military Science (Army Reserve Officers' Training Corps)
- Music and Theatre
- Naval Science
- Philosophy and Religious Studies
- Physics and Astronomy
- Political Science
- Psychology
- Sociology and Criminal Justice
- Statistics
- World Languages and Cultures

### Cross-Disciplinary and Interdisciplinary Programs

The College of Liberal Arts and Sciences has a variety of interdisciplinary and cross-disciplinary programs that draw on faculty expertise across multiple departments. Students may enroll in courses offered by these programs, declare majors, certificates or minors where offered, or propose an Interdisciplinary Studies major.

- African and African American Studies Program
- American Indian Studies Program
- Bachelor of Liberal Studies Program
- Biological/Premedical Illustration Program
- Communication Studies
- Data Science

- Environmental Science and Environmental Studies
- Interdisciplinary Studies Program
- International Studies Program
- Leadership Studies
- Premedical and Preprofessional Health Programs
- Sustainability Program
- U.S. Latino/a Studies Program
- Women's and Gender Studies Program

## MAJORS

Students majoring in the College of Liberal Arts and Sciences must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated for the major.

- Advertising, B.A.
- Anthropology, B.A., B.S.
- Biochemistry, B.S.
- Bioinformatics and Computational Biology B.S.
- Biological/Pre-Medical Illustration, B.A.
- Biology, B.S.
- Biophysics, B.S.\*
- Chemistry, B.A., B.S.
- Climate Science, B.S.
- Communication Studies, B.A.
- Computer Science, B.A., B.S.
- Criminal Justice, B.A.
- Data Science, B.S.
- Earth Science, B.A., B.S.
- Economics, B.S.
- English, B.A., B.S.
- Environmental Science, B.S.
- Environmental Studies (secondary major only)
- French (see World Languages and Cultures, below)
- Genetics, B.S.
- Geology, B.S.
- German (see World Languages and Cultures, below)
- History, B.A., B.S.
- Interdisciplinary Studies, B.A., B.S.
- International Studies (secondary major only)
- Journalism and Mass Communication, B.S.
- Liberal Studies, B.L.S. (a general studies degree)
- Linguistics, B.A.
- Mathematics, B.S.
- Meteorology, B.S.

- Music, B.A., B.Mus.
- Performing Arts, B.A.
- Philosophy, B.A.
- Physics, B.S.
- Political Science, B.A.
- Professional Studies, B.L.S. (a general studies degree)
- Psychology, B.A., B.S.
- Public Relations, B.S.
- Religious Studies, B.A.
- Sociology, B.A., B.S.
- Software Engineering, B.S.
- Spanish (See World Languages and Cultures, below)
- Speech Communication, B.A.\*
- Statistics, B.S.
- Technical Communication, B.S.
- Women's and Gender Studies, B.A., B.S.
- World Languages and Cultures B.A.:
  - French
  - German
  - Spanish

*\*This program will be discontinued Fall 2023 pending Board of Regents State of Iowa approval; the Biochemistry major now has a formal program focus in biophysics.*

A secondary major must be taken in conjunction with a primary major.

## MINORS

In addition to University policies governing minors, LAS minors require at least 6 credits in courses numbered 300 and above, taken at ISU with a grade of C or higher. Completed minors will be recorded on the transcript.

- Advertising
- African and African American Studies
- American Indian Studies
- Anthropology
- Astronomy
- Biochemistry
- Bioinformatics and Computational Biology
- Biological/Pre-Medical Illustration
- Biology
- Chemistry
- Chinese Studies
- Classical Studies
- Communication Studies

- Computer Science
- Criminal Justice
- Data Science
- Economics
- English
- Entrepreneurship\*
- Environmental Studies
- Ethics
- French
- Genetics
- Geology
- German
- Gerontology\*
- History
- International Studies
- Journalism and Mass Communication
- Leadership Studies
- Linguistics
- Mathematics
- Meteorology
- Middle Eastern Studies
- Military Studies (Army Reserve Officers' Training Corps)\*
- Music
- Music Technology
- Performing Arts
- Philosophy
- Physics
- Political Science
- Psychology
- Public Relations
- Religious Studies
- Russian Studies
- Sociology
- Spanish
- Spanish Translation and Interpretation Studies
- Speech Communication
- Statistics
- Sustainability\*
- Teaching English as a Second Language
- Technical Communication
- U.S. Latino/a Studies

- Women's and Gender Studies
- World Film Studies

\*The College of Liberal Arts and Sciences participates in these interdepartmental minors.

## Certificate Programs

University policies governing Certificate Programs are found in the Degree Planning section of the catalog.

- Actuarial Science Certificate
- Computing Applications Certificate
- Data Science Certificate
- Latin American Studies Certificate
- Leadership Studies Certificate
- Science Communication Certificate

## LAS College Requirements

To obtain a bachelor's degree in any program offered by the College of Liberal Arts and Sciences, an undergraduate student must meet all university graduation requirements including:

- minimum of 120 credits
- minimum of 32 semester credits earned in residence at Iowa State University
- last 32 credits in residence
- GPA of 2.0 or better on courses taken at Iowa State University
- Information Literacy Requirement (credit for LIB 160 Introduction to College Level Research)
- Communication Proficiency Requirement (credit for ENGL 150, ENGL 250\*, and upper-level coursework)
- U.S. diversity and international perspectives requirements

*\*The College of Liberal Arts and Sciences aligns with the University Communication Proficiency Grade Requirement. At a minimum, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250; some majors set higher requirements for communication proficiency. For other university policies governing ISU degree programs, see Academics.*

Students with majors leading to Bachelor of Science or Bachelor of Arts degrees, must also meet all college and program specific requirements including:

- General Education
- World Language
- Advanced Credits

- Career Proficiency
- Completion of the Major

## General Education

Requirements in a major are designed to develop depth, or mastery of a specific field or discipline, while courses in general education are designed to establish breadth, or a strong, intellectual foundation to support learning for all majors.

### General Education Requirements and Learning Goals

The general education areas with their minimum credit requirements for the College of Liberal Arts and Sciences are:

- Arts and Humanities—(Minimum 12 credits). The student should develop an understanding of human cultural heritage and history, and an appreciation of reasoning and the aesthetic value of human creativity.
- Mathematical Disciplines and Natural Sciences —(Minimum 11 credits, including 3 in the mathematical disciplines and 8 in the natural sciences). The student should appreciate mathematics as a valuable tool of the sciences and as an intrinsically important way of thinking, and should experience science as a rational search for understanding the structure and behavior of the natural world.
- Social Sciences—(Minimum 9 credits). The student should develop an appreciation of the principal methods of studying human behavior and an understanding of the structure and functioning of institutions.

Lists of courses approved for the three general education areas are available on the LAS College website (<http://www.las.iastate.edu/students/academics/general-education/>). Students may not apply the same course in more than one general education area.

Because students fulfill, in part, the learning goals of the area of their first major by taking courses in their programs of study, the minimum number of general education credits required in the area of the first major is reduced from that listed above by 3 credits. Students in Liberal Studies or Interdisciplinary Studies majors must complete the minimum requirements in all three areas.

Consistent with its breadth goal, courses with the designator of a student's first major may not be applied to general education requirements. Courses cross-listed with a course in the student's first major may be used to satisfy either major requirements or general education requirements, but may not be used more than once. Courses taken to meet the requirements of a second major, third major or certificate may be counted in the general education groups.

Seminars and experimental courses may be acceptable as general education; advisors should consult with the LAS college office. Orientation courses, independent study courses (usually numbered 290



or 490), cooperative courses, courses numbered 500 and above, and courses taken on a satisfactory-fail (S-F) or pass-not pass (P-NP) basis cannot be applied to a general education group.

## World Language Requirement

The faculty of the College of Liberal Arts and Sciences believes that undergraduate students should acquire elementary practical experience in a second language, should be introduced to the theoretical study of language structure, and should begin to develop an understanding of a second culture through study of that culture's language. Students meet this expectation by satisfying a graduation requirement equivalent to the first year of university-level study in one world language.

Students may meet this requirement through several pathways:

- completing three or more years of high-school world language study in a single language
- passing the exam for credit at the 102 level
- receiving a passing grade in an ISU 102 world language or American Sign Language (ASL) course, an approved ISU intensive or accelerated world language course, or equivalent transfer course
- receiving a passing grade in a world language course taught in a language other than English at the 200-level or higher
- being a native speaker of a language other than English
- completing a major in any world language

Questions about the World Language Requirement and how to meet it should be directed to the College Academic Services office in 102 Catt Hall. Credits applied toward the World Language Requirement cannot be used to satisfy the general education requirements, but students who have fulfilled the World Language Requirement may apply approved courses in world languages toward the appropriate general education areas.

## Advanced Credit Requirements

To obtain a bachelor's degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences, a student must earn at least 45 credits at the 300 level or above taken at a four-year college. All such credits, including courses taken on a pass/not pass basis, may be used to meet this requirement.

## Career Proficiency Requirement

Students will demonstrate knowledge of foundational career preparation topics such as internship and job search resources and processes, identifying and developing personal strengths and experiences, preparing application materials, interviewing, negotiating offers, and understanding ISU career services resources.

The minimum expectations of this career-readiness requirement will be met by successful completion of LAS 203 Professional Career Preparation.

Students are expected to complete the minimum requirement before their third year (before their third semester at ISU for transfer students) and are encouraged to continue developing their career proficiency beyond the minimum through internships, co-ops, research, entrepreneurial activities and other professional development experiences and coursework during their Junior and Senior years.

## The Major

Students must show they have achieved depth in a specialized area by completing successfully the requirements and learning goals of a major. A major comprises 24 to 50 credits in a program of study as determined by the faculty. Tracks within a major must have a common core that supports learning outcomes of the major. Some courses outside the major discipline may also be required as supporting work for the major. (See Majors, Minors and Certificates to find individual department and program requirements.)

The average grade of all courses in the major (those courses listed under major on the degree audit) must be 2.0 or higher. The major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student's grade is C or higher. Some majors have specific GPA requirements for key courses or groups of courses.

Courses with the designator of the first major listed on the degree program may not be counted in the general education groups.

The major in Interdisciplinary Studies (B.A., B.S.) is available for undergraduate students who have unique interdisciplinary educational goals. Such a major is designed by the faculty and the student and is approved only when the educational goals cannot be met by a reasonable combination of existing majors, minors, and certificates.

## Additional Majors

Students may elect an additional major from the departments and program areas in the College of Liberal Arts and Sciences, or from a different major field offered for the bachelor's degree in another college of the university.

When choosing an additional major, students must confirm that the additional major is allowable; currently the following combinations of majors are not allowed, as multiple majors or multiple degrees:

- Economics with Business Economics
- Any combination of Journalism and Mass Communication, Advertising, and Public Relations.

Students interested in pursuing multiple majors should talk to their advisor about the process. If one major leads to the B.A. degree and the other to the B.S. degree, the degree awarded will be the one offered by the department of the primary major. If the primary major may lead to either a B.A. or a B.S., a student may choose to receive either degree. In all cases, the student must satisfy the requirements of each major and the general education and other degree requirements for the primary major. Students with a primary major in another college who wish to take a second major in the College of Liberal Arts and Sciences must meet all requirements of the second major, but are exempt from the LAS College General Education, World Language, Career Proficiency and Advanced Credits requirements.

University policies for students wishing to double major or earn two Bachelor's Degrees are found in the Degree Planning section of the catalog.

## Minors and Certificates

In addition to earning a major a student may want to complete a minor or certificate to indicate a special concentration of study. University policies related to minors and certificates and lists of all minors and certificates are available in the catalog. See the Degrees, Majors, Minors and Certificates tab in the LAS section of the catalog for all minors and certificates offered by the college. In addition to University policies governing minors, LAS minors require at least 6 credits in courses numbered 300 and above, taken at ISU with a grade of C or higher. Completed minors and certificates will be recorded on the transcript.

## Bachelor of Music Curriculum

In addition to the major in music leading to a Bachelor of Arts degree, the LAS College offers a Bachelor of Music degree (B.Mus.). In order to pursue teacher certification and recommendation for licensure in music, students must earn the Bachelor of Music degree. Bachelor of Music students select one of the following options: music education [vocal or instrumental], performance [voice, piano, organ, string instruments, wind or percussion instrument], or composition. For details about both degrees, see Music, Degree Requirements.

## Bachelor of Liberal Studies Curriculum

The LAS College also administers the Bachelor of Liberal Studies (B.L.S.) degree, a bachelor's degree program established by Iowa Board of Regents and offered by all three Regents institutions. The B.L.S. is a general studies degree. While the B.L.S. does not have traditional majors focused on a specific discipline, students may choose to pursue the Liberal Studies Major, taking coursework in three areas of distribution, or the Professional Studies Major, taking coursework aimed to develop broad professional competencies in critical thinking, communication, leadership/teamwork, and technology. With the assistance of a B.L.S. advisor, students can structure a program that meets their individual educational, vocational or personal goals. Students in the B.L.S. program

are not eligible for additional majors, but they may earn a Certificate or minor by completing all of the requirements of those programs. Criteria for graduating with distinction and other academic honors with a B.L.S. degree are available under Scholastic Recognition.

For specific degree requirements, see Bachelor of Liberal Studies.

## Software Engineering Curriculum

A Bachelor of Science degree in software engineering is jointly administered by the College of Liberal Arts and Sciences and the College of Engineering. The program is aimed at creating high-quality software in a systematic, controlled, and efficient manner. The specific objective of the program is to educate students on principles, processes, techniques, and tools for producing, analyzing, specifying, designing and evolving software. A broader objective is to cultivate among students intellectual curiosity, problem-solving skills, good learning habits, effective communication skills, leadership, and teamwork.

This cross-college program enables students to take a range of Software Engineering courses, as well as elective courses from both Computer Science and Computer Engineering as part of their degree program.

For specific degree requirements, see Software Engineering.

## Additional Curricular Policies

In addition to the policies outlined in the above discussion of the curricula of the LAS College:

- Elective courses as well as general education courses may be used to meet the requirements of a minor, certificate or additional major, provided that they are taken on a graded basis.
- Courses taken on a pass/not pass basis may be counted toward the required total of 120 credits and may be used to meet the advanced credit requirement, if appropriate, but may not be used to satisfy any other graduation requirement.
- No more than 9 credits of 490 (Independent Study) courses may be counted toward graduation.
- Criteria for graduating with distinction and other academic honors are available under [Scholastic Recognition](#).
- Students whose high school study of world languages meets the College World Language Requirement may not enroll in or receive credit for 101 or 102 in that language.
- Students are responsible for talking to their academic advisors, using the degree audit, and reviewing other University policies. See the Academics section of the catalog.

## Open Option

Students who enter Iowa State University and want time to explore the best match between their academic interests, abilities, and career goals may do so as Open Option students. The Open Option experience

is designed to help students explore majors and careers, become acquainted with the entire university, and make successful adjustments to the academic expectations of Iowa State.

Open Option students are assigned academic advisors who specialize in working with students who have not declared a major. First-year Open Option students take LAS 101 and participate in the HOME learning community. This orientation experience introduces students to campus resources as well as to all of the colleges and majors on campus.

Aided by their advisor, Open Option students select courses that allow them to explore their academic interests before committing to a specific university major. Open Option students typically declare a major during their second or third semester. In addition, students who may have started in a specific field and have discovered it is not meeting their needs may transfer into Open Option for a semester or two while they decide on a new major.

For more information, visit the Open Option webpage (<https://openoption.iastate.edu/>).

## Opportunities for Students

The College of Liberal Arts and Sciences provides many opportunities for students to enhance their knowledge, skills and credentials beyond traditional academic work in their majors, minors or certificate programs.

## Honors Program

Students enrolled in the College of Liberal Arts and Sciences are encouraged to participate in the University Honors Program.

Liberal Arts and Sciences Honors is designed to add depth, breadth and challenge to enrich students' programs of study and intellectual development. Students in Liberal Arts and Sciences Honors benefit from the resources and capabilities of a large and dynamic research university along with the intellectual community that characterizes smaller, selective liberal arts colleges. Membership in LAS Honors offers specific benefits to students such as collaborations with individual faculty members on Honors projects, extended library loan privileges, 24-hour use of the Jischke Honors Building and priority registration for classes.

LAS Honors encourages freshmen as well as more advanced students to apply. Upon graduation, students who fulfill all of the requirements of the Honors Program are recognized by a special notation on their diploma and permanent record. Honors students wear white Honors cords at graduation.

## Learning Communities

Students in the LAS College can participate in a variety of learning community options that support student success by supporting the transition to college life. There are various kinds of learning communities

both within and across majors. Most learning communities involve small groups of students who take one or more classes in common and have a staff person or peer mentor who supports students as they make connections and get engaged at ISU.

See <http://www.lc.iastate.edu/> for more information.

## Teacher Preparation

Teaching licenses are issued by the Iowa Board of Educational Examiners. The Recommending Officer for the ISU University Teacher Education Program submits each candidate file after that candidate is determined to be eligible for recommendation. Recommendations for teaching licensure are issued for a specific teaching level, e.g., grades 5-12. Subject area endorsements are listed on the candidate's license. The College of Liberal Arts and Sciences collaborates with the School of Education to prepare students for recommendations for licensure in approved programs. Students who plan to teach in secondary schools (grades 5-12) may work toward completing an approved teacher preparation program in one of the following majors:

- Biology
- Chemistry
- Earth Science
- English
- History
- Mathematics
- Music (through the Bachelor of Music curriculum)\*
- Physics
- Political Science
- World Languages and Cultures (Endorsements are available in French, German, and Spanish.)

Students may also prepare for recommendation for additional endorsements. For further information, see Educator Preparation.

\*Students in the College of Liberal Arts and Sciences who complete the approved teacher preparation program in music education (B.Mus. degree with Vocal K-12 option or Instrumental K-12 option) and meet all other requirements may be recommended for a teaching license that allows them to teach music in grades K-12.

## Preprofessional Programs

Any major in the College of Liberal Arts and Sciences provides excellent preparation for entry to professional schools. Students may enter the college with a designation of Pre-Med, Pre-Law or Preprofessional Health. Most students will earn a bachelor's degree in the major of their choosing while also completing the courses required for admission to professional schools. Some students will spend one to three years as

students in the college before transferring to a professional school where they have been accepted to complete their studies.

Preprofessional students are encouraged to pursue a major that interests them and where they excel. Advisors work with students to develop a program of study within their major that meets admission requirements to professional school and develops a student's credentials for the competitive application process to professional schools. For further information, see Opportunities for Preprofessional Study.

The College of Liberal Arts and Sciences participates in a 3+3 program with the Law Schools at Drake University and at the University of Iowa which allows qualified students to complete three years at Iowa State and transfer coursework from the first year of law school to complete their bachelor's degree requirements. Visit the Liberal Arts and Sciences Student Services office for details.

## Reserve Officers' Training Corps Programs (ROTC)

The College of Liberal Arts and Sciences also offers students the opportunity to combine their academic programs with ROTC programs in Military Science (Army), Naval Science (Navy, Marine Corps), and Air Force Aerospace Studies (Air Force, Space Force). See Officer Education Programs for more information.

## Study Abroad and National Student Exchange

The LAS College offers many study abroad and domestic exchange program options to enhance the undergraduate experience. Every year hundreds of students expand their horizons through these programs while they stay on track for graduation.

LAS Study Abroad provides international study, work, and service opportunities for all Iowa State students. LAS supports faculty and staff to facilitate learning opportunities abroad, and partners with organizations to offer a breadth of program options.

International learning opportunities for LAS students come in varied formats, from semester-long experiences focused on language immersion to three-week long global seminars that focus on interdisciplinary subjects. Faculty-led programs are among the most sought-after by our undergraduates, as they pair faculty expertise and ISU credit with the opportunity to explore other lands and cultures. Other program types available to students are exchanges, direct-enroll and affiliate programs.

LAS students can also work with the ISU National Student Exchange program to explore options to study out-of-state at one of more than 200 universities within the United States, US Territories, and Canada.

Visit LAS Study Abroad (<https://abroad.las.iastate.edu/>) or the National Student Exchange website (<https://www.nse.dso.iastate.edu/>) for more information.

## Undergraduate Research

The LAS College has hundreds of faculty actively engaged in research and most majors have designated independent study and/or research courses. Students are encouraged to talk to faculty about how they can be involved in the process of discovery.

## LAS Innovation and Entrepreneurship Academy

The College of Liberal Arts and Sciences I+E Academy (<https://las.iastate.edu/students/lasinnovates/>) offers a two-year program open to all LAS majors, where students engage in online, face-to-face, and interactive activities to experience and develop an innovative and entrepreneurial mindset. The program matches students with a mentor in the second year and connects students with other on campus opportunities such as ISU's Pappajohn Center for Entrepreneurship (<https://www.isupjcenter.org/>) and Student Innovation Center offerings (<https://sictr.iastate.edu/>) where students can further develop their innovative ideas.

## Career Services and Internships

LAS Career Services supports students' career exploration, career development, and professional career search assistance. The career development process requires students to proactively plan and engage with applied learning experiences, such as internships, research, and leadership positions, throughout their time on campus. LAS Career Services strongly recommends students have 1-2 internships before entering the workforce.

LAS Career Services offers career advising, internship and job search resources, and organizes events such as career fairs that connect students with employers. Services are available to undergraduates, graduate students, and alumni. Academic credit may be available for internships/co-op through departments and LAS Career Services.

For additional information, explore the LAS Career Services website (<https://careers.las.iastate.edu/>) or visit their office on the first floor of Carver Hall.

## Advertising ADVERTISING

<http://www.greenlee.iastate.edu> (<http://www.greenlee.iastate.edu/>)

The advertising major prepares students for careers in business and industry or for graduate education. Students majoring in advertising find career opportunities in professions requiring applied communication

expertise. Graduates are qualified for positions in the creative and account sides of advertising within businesses, agencies and media. Coursework in this major focuses on writing, research, digital and emerging media, and professional abilities. Students are required to complete a capstone internship experience to practice and refine their skills.

The Greenlee School of Journalism and Communication prepares students for the field of communication. The school offers three majors:

- Advertising Bachelor of Arts (ADVRT)
- Journalism and Mass Communication Bachelor of Science (JL MC)
- Public Relations Bachelor of Science (P R)

In addition, the Greenlee School offers a 4+1 program allowing students to complete their B.A. or B.S. and earn an M.S. in journalism and mass communication in fewer semesters.

Professional skills are taught and practiced alongside academic requirements using the latest technology and leading-edge communication trends and methods.

Founded in 1905, the unit was one of the first journalism programs to be accredited in 1948 and continues to be one of the longest continuously accredited programs in the country. Accreditation is based on the principle that students need a broad-based, liberal arts education and solid core courses within the discipline. Students taking one major at the school may not seek an additional major or a minor in the school. All students are required to take an additional major or a minor outside the school as an area of expertise.

Student Learning Outcomes

Students who major in programs of the Greenlee School of Journalism and Communication are expected to develop competencies in 10 key areas:

- apply the principles and laws of freedom of speech and press, in a global context, and for the country in which the institution that invites ACEJMC is located;
- demonstrate an understanding of the multicultural history and role of professionals and institutions in shaping communications;
- demonstrate culturally proficient communication that empowers those traditionally disenfranchised in society, especially as grounded in race, ethnicity, gender, sexual orientation and ability, domestically and globally, across communication and media contexts;
- present images and information effectively and creatively, using appropriate tools and technologies;
- write correctly and clearly in forms and styles appropriate for the communications professions, audiences and purposes they serve;

- demonstrate an understanding of professional ethical principles and work ethically in pursuit of truth, accuracy, fairness and diversity;
- apply critical thinking skills in conducting research and evaluating information by methods appropriate to the communications professions in which they work;
- effectively and correctly apply basic numerical and statistical concepts;
- critically evaluate their own work and that of others for accuracy and fairness, clarity, appropriate style and grammatical correctness;
- apply tools and technologies appropriate for the communications professions in which they work.

The Advertising Major

To receive a bachelor of arts degree in advertising, a student must earn at least 120 credits. A minimum of 72 credits must come from courses other than ADVRT, JL MC or P R. At least 50 of these credits must come from the liberal arts and sciences. Overall, at least 45 credits must be from 300-level courses or above.

The degree requirements allow for a minimum of 34 credits and a maximum of 48 credits to be taken in ADVRT, JL MC or P R. These include:

JL MC 110	Orientation to Journalism and Communication	1
JL MC 201	Reporting and Writing for the Mass Media (C+ or better)	3
ADVRT 230	Advertising Principles	3
ADVRT 301	Research and Strategic Planning for Advertising and Public Relations	3
One of the following two courses with C+ or better		
ADVRT 334	Advertising Creativity	3
or ADVRT 336	Advertising Account Management	
300-level ADVRT, JL MC, or P R Electives		6
One of the following two courses:		
ADVRT 434	Advertising Campaigns	3
or ADVRT 436	Advertising Creative Portfolio	
JL MC 460	Law of Mass Communication	3
JL MC 462	Media Ethics, Freedom, Responsibility	3
400-level ADVRT, JL MC, or P R Elective		3
ADVRT 499A	Professional Media Internship: Required	3
Total Credits		34

Advertising majors are also required to take:



MKT 340	Principles of Marketing	3
STAT 101	Principles of Statistics (or another approved statistics course)	4

As majors in the College of Liberal Arts and Sciences, advertising students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

**University Requirement:** Students in all ISU majors must complete a three-credit course in U.S. Diversity, as well as a three-credit course in International Perspectives. The approved course lists are found at the following web addresses: (U.S. Diversity) <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses>) and (International Perspectives) <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current>). Students must also demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

**College of LAS Requirement:** Minimum of 120 credits, including a minimum of 45 credits at the 300-level and above. You must also complete the LAS world language requirement, LAS career proficiency requirement, and any unmet ISU admission requirements.

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

**Minor or Additional Major:** Students are required to fulfill a secondary area of expertise. This requirement can be met by declaring a minor or an additional major outside of the Greenlee School of Journalism and Communication. Students taking one major at the school may not seek an additional major or minor in the school.

Juniors can apply to a concurrent degree program and earn a B.A. in advertising and an M.S. in journalism and mass communication in fewer semesters. Contact the Director of Graduate Education for more information on the Greenlee School's 4+1 Program.

## Advertising, B.A.

### Freshman

Fall	Credits	Spring	Credits
ENGL 150		3 ECON 101	3
JL MC 110		1 LIB 160	1
Arts and Humanities		3 ADVRT 230	3
Natural Science		3 JL MC 201	3

Social Science	3 Arts and Humanities	3
	Natural Science	3

**13 16**

### Sophomore

Fall	Credits	Spring	Credits
ADVRT 301		3 ADVRT 334 or 336	3
ENGL 250		3 Arts and Humanities	3
STAT 101		4 Social Science	3
Natural Science		2 U.S. Diversity	3
World Languages and Cultures or Elective		3-4 World Languages and Cultures or Elective	3-4
LAS 203		1	

**16-17 15-16**

### Junior

Fall	Credits	Spring	Credits	Summer	Credits
ADVRT/JL MC/P R-300 level choice		3 ADVRT/JL MC/ P R choice-300 level		3 ADVRT 499A	3
MKT 340		3 ADVRT/JL MC/P R choice-400 level		3	
Arts & Humanities		3 International Perspective		3	
Minor/ additional major choice		3 Minor/ additional major choice-300 level		3	
Minor/ additional major choice		3 Minor/ additional major choice-300 level		3	

**15 15 3**



**Senior**

Fall	Credits	Spring	Credits
JL MC 460	3	JL MC 462	3
One of the following:	3	Elective or Minor/ additional major choice-300 level or above	3
ADVRT 434		Elective or Minor/ additional major choice-300 level or above	3
ADVRT 436		Elective or Minor/ additional major choice-300 level or above	3
ADVRT/JL MC/ P R 400-level choice*	3		
Minor/ additional major choice-300 level or above	3		
Elective or Minor/ additional major choice-300 level or above	3		
15		12	
Total Credits: 120-122			

## Minor in Advertising

Students cannot select more than one minor in the Greenlee School of Journalism and Communication. Minors in the Greenlee School are not available to Greenlee majors.

For a minor in advertising, students complete 15 credits. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

JL MC 101	Mass Media and Society	3
ADVRT 230	Advertising Principles	3
ADVRT 301	Research and Strategic Planning for Advertising and Public Relations	3
6 credits from the following:		6
ADVRT 335	Advertising Media Planning	
JL MC 307	Digital Video Production	
JL MC 390	Professional Skills Development	
JL MC 401	Mass Communication Theory	
JL MC 406	Media Management	
JL MC 474	Communication Technology and Social Change	
JL MC 476	World Communication Systems	
JL MC 477	Diversity in the Media	
ADVRT 497	Special Topics in Communication	
<b>Total Credits</b>		<b>15</b>

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

## Concurrent Undergraduate and Graduate Programs

The Greenlee School offers three concurrent degree programs:

- B.A. Advertising/M.S. Journalism and Mass Communication
- B.S. Journalism/M.S. Journalism and Mass Communication
- B.S. Public Relations/M.S. Journalism and Mass Communication

Enrollment in the Greenlee School's concurrent degree programs enables students to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees. See Journalism and Mass Communication Concurrent Undergraduate and Graduate Programs for more information on combining the B.A. in Advertising and the M.S. in Journalism and Mass Communication.

## GRADUATE PROGRAMS

### Master of Science

The Greenlee School of Journalism and Communication offers work for a Master of Science degree in journalism and mass communication.

### Concurrent Programs

The Greenlee School's concurrent degree programs enable interested students the opportunity to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees.

### Graduate Minor

The Greenlee School graduate program offers minor work for students majoring in other departments.

See Journalism and Mass Communication Graduate Programs for more information on the M.S. in Journalism and Mass Communication.

## African and African American Studies

Interdepartmental Undergraduate Program

African and African American Studies, a cross-disciplinary program in the College of Liberal Arts and Sciences, offers students the opportunity to explore the African Americans' experience and African American contributions to American culture. Students in the program analyze and learn about African American experiences through the study of history, literature, art, religion, and society. They gain knowledge and develop skills and sensitivities to help them function effectively in today's diverse society.

African and African American Studies at Iowa State University is an expanding program. Many of the courses in the program satisfy general education requirements in the College of Liberal Arts and Sciences, the human relations requirement for teachers, and the university's diversity requirement; please consult official lists. Students can minor or even design their own Interdisciplinary Studies major with an emphasis in African American Studies. Relevant courses are offered through other departments.

### Undergraduate Minor

A minor in African and African American Studies requires six courses in the program with a minimum of 18 credits, including AF AM 201 Introduction to African American Studies and AF AM 460 Seminar in African American Culture. The remaining credits must come from at least two departments, with at least two courses taken at the junior level or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Independent study and internship opportunities are available for credit, but do not count in the minimum requirements for the minor.

## Air Force Aerospace Studies Program

The Department of Air Force Aerospace Studies (AFAS) is set within the College of Liberal Arts and Science as an interdisciplinary program but does not offer an academic Degree. The courses offered in the program are developed by the Air Force Air Education and Training Command and approved by the Department of the Air Force. The Department of Air Force Aerospace Studies aims to provide qualified student leaders the opportunity to earn a commission as active duty officers in the United States Air Force (USAF) or United States Space Force (USSF). All AFAS courses are open to any ISU student who has met the course prerequisites. Entry into the Air Force Reserve Officer Training Corps (AFROTC) program is not dependent on a departmental major or year in the university and is open to all qualified students; however, it is intended for students who have at least three years of coursework remaining.

For further information on AFAS and AFROTC, please get in touch with [afrotc@iastate.edu](mailto:afrotc@iastate.edu) or call 515-294-1716.

### Undergraduate Study

The curriculum is divided into two basic phases: the General Military Course (GMC) and the Professional Officer Course (POC). The GMC is introductory and open to all ISU students. It consists of four consecutive one-hour courses normally taken during the freshman and sophomore years.

Selection for entry into the POC is on a competitive basis. Cadets enrolling in this course must meet certain academic, mental, and physical requirements as well as having high moral standards. If selected, cadets who have completed the GMC will attend Field Training, a two-week intensive summer program aimed at evaluating a cadet's leadership, followership, and problem solving skills. Field Training includes officer training, physical training, career orientation, expeditionary training, and an introduction to military base functions. Successful completion of Field Training is a requirement to enter the POC.

Upon enrollment and acceptance into the POC, all cadets complete a contractual agreement with the Air Force, committing them to serve at least four years on active duty as a U.S. Air Force (USAF) or U.S. Space Force (USSF) officer after graduation. Cadets interested in an aviation career are able to compete for positions as a pilot, combat systems operator (CSO), remotely-piloted aircraft (RPA) operator, or air battle manager (ABM).

### Example schedules for GMC and POC cadets: GMC

- 1 hour per week in the AFAS academic course
- 3 hours per week of physical training which is typically held at 6 am on Monday, Wednesday and Thursday

- 2 hours per week of Leadership Laboratory (LLAB) held Tuesday mornings at 6 am

### POC

- 3 hours per week in the AFAS academic course
- 3 hours per week of physical training which is typically held at 6 am on Monday, Wednesday and Thursday
- 2 hours per week of Leadership Laboratory (LLAB) held Tuesday mornings at 6 am

AFROTC scholarships are available and provide payment for up to full tuition and fees. In addition, scholarship cadets receive a \$300-\$500 monthly subsistence allowance and \$900 per year book allowance. Scholarships can be awarded for periods from two to five years, depending on academic major. Upon acceptance of a scholarship, students complete a contractual agreement with the Air Force, which commits them to serve at least four years on active duty as a USAF or USSF officer after graduation. To determine eligibility and initiate application procedures for the scholarship program, interested students should contact the AFAS department.

### Military Studies Minor

The College of Liberal Arts and Sciences offers a minor in Military Studies. Requirements for the minor include taking a minimum of 15 credits of ROTC instruction, which may be taken from one or more of the ROTC programs. At least six credits must be in courses numbered 300 or above.

## American Indian Studies Minor

### American Indian Studies Minor

American Indian Studies is a cross-disciplinary minor in the College of Liberal Arts and Sciences that allows students to learn more about the contemporary and historical realities of native communities in North America, to appreciate the variety of native cultures and experiences, and to be prepared for an attentive lifelong learning experience in a diverse world.

Courses focus on critical thinking and the application of knowledge in complex, diverse situations. Courses in American Indian Studies thus not only provide knowledge on specific native issues, but also prepare students for careers and further studies in fields such as community development and planning, social work, law, sociology, education, history, anthropology, agriculture, resource extraction, literature, policy, engineering, or environmental issues.

Today, 80% of American Indians live outside of reservation communities. American Indian Studies students will gain the knowledge and skills they need for living and working with, in, and around native communities and people who live everywhere in North America, and, increasingly, the world.

For students who are interested in deeper knowledge on the issues, a major can be pursued through the Interdisciplinary Studies major in the College of Liberal Arts and Sciences. Faculty members also are available to provide expertise to graduate students working on specific issues that involve American Indian themes.

The minor in American Indian Studies is 15 credits and includes:

AM IN 210	Introduction to American Indian Studies	3
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And 12 additional credits of AM IN coursework, of which at least 9 credits need to be 300-level courses or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

Coursework will be established in consultation with the program director through the Curriculum Change Form.

## Anthropology Overview

The ISU program in Anthropology is housed in the Department of World Languages and Cultures (<http://catalog.iastate.edu/collegeofliberalartsandsciences/worldlanguagesandcultures/>).

Anthropology students develop a well-rounded professional education in cultural anthropology, archaeology, and biological anthropology. An undergraduate major in Anthropology can serve as the nucleus for a general liberal education, or as the prerequisite for graduate training qualifying a person for positions in (1) college and university teaching, (2) research, and (3) administrative and applied positions in government, development organizations, museums, and private businesses or corporations.

Anthropology majors may choose either a bachelor of arts or a bachelor of science degree, both of which require 33 credits in anthropology. A bachelor of arts degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Area I (Arts and Humanities) or III (Social Sciences) or a combination of both. A bachelor of science degree is obtained by fulfilling the college general education requirements plus 6 additional credits in Area IIA (Mathematics) or IIB (Natural Sciences) or a combination of both. All students must also complete a minor or a second major as part of their degree requirements.

### Student Learning Outcomes

Upon completion of the major in anthropology, students will be able to:

1. Explain what it means to be human through the study of culture and society, the biology and evolution of humans and other primates, and through the study of past human communities and material culture;

2. Demonstrate knowledge of the important historical and contemporary issues in the subdisciplines of archaeological, biological, and cultural anthropology;
3. Describe and evaluate local and global issues from an anthropological perspective;
4. Demonstrate an understanding of the value of cultural diversity.

## Degree Requirements

Undergraduate students with majors in anthropology are required to take the following anthropology core courses:

ANTHR 201	Introduction to Cultural Anthropology	3
ANTHR 202	Human Origins	3
ANTHR 306	Culture and Interpretation	3
ANTHR 307	Biological Anthropology	3
ANTHR 308	Archaeology	3
ANTHR 450	Approaches in Anthropology	3
One of the following methods courses is required:		3
ANTHR 319	Skeletal Biology	15
or ANTHR 32 Archaeological Discovery and Analysis		
or ANTHR 43 Ethnographic Methods		

In addition to the above, 15 ANTHR choice credits are required. 15

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

Additionally, the Anthropology Program requires a grade of C or better in one of the following courses:

ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	

The principal sub-disciplines of anthropology are represented by the following:

### 1. Cultural anthropology:

ANTHR 201	Introduction to Cultural Anthropology	3
ANTHR 230	Globalization and the Human Condition	3
ANTHR 306	Culture and Interpretation	3
ANTHR 309	Introduction to Culture and Language	3
ANTHR 310	Environmental Anthropology	3
ANTHR 313	Kinship and Marriage in a Global Perspective	3

ANTHR 322	Peoples and Cultures of Native North America	3
ANTHR 323	Topics in Latin American Anthropology	3
ANTHR 332	Current Issues in Native North America	3
ANTHR 336	Culture and Capitalism	3
ANTHR 340	Magic, Witchcraft, and Religion	3
ANTHR 342	Culture, Sex, and Gender	3
ANTHR 354	War and the Politics of Humanitarianism	3
ANTHR 355	Understanding Sub-Saharan Africa	3
ANTHR 411	Anthropology for Global Professionals	3
ANTHR 431	Ethnographic Methods	3
ANTHR 434B	Internship: Cultural Anthropology	2-6
ANTHR 434D	Internship: Linguistic Anthropology	2-6
ANTHR 450	Approaches in Anthropology	3
ANTHR 451B	Practicum in Anthropology: Cultural Anthropology	1-3
ANTHR 451D	Practicum in Anthropology: Linguistic Anthropology	1-3
ANTHR 490B	Independent Study: Cultural Anthropology	1-5
ANTHR 490D	Independent Study: Linguistic Anthropology	1-5

### 2. Archaeology:

ANTHR 202	Human Origins	3
ANTHR 308	Archaeology	3
ANTHR 315	Archaeology of North America	3
ANTHR 320	Great Plains Archaeology	3
ANTHR 321	World Prehistory	3
ANTHR 328	Archaeological Discovery and Analysis	3
ANTHR 429	Topics in Archaeological Laboratory Methods and Techniques: Archaeological Field School	4-6
ANTHR 434A	Internship: Archaeology	1-6
ANTHR 450	Approaches in Anthropology	3
ANTHR 451A	Practicum in Anthropology: Archaeology	1-3
ANTHR 490A	Independent Study: Archaeology	1-5

### 3. Biological Anthropology:

ANTHR 202	Human Origins	3
ANTHR 307	Biological Anthropology	3
ANTHR 317	Primate Behavior, Ecology, and Evolution	3
ANTHR 319	Skeletal Biology	3
ANTHR 424	Forensic Anthropology	3
ANTHR 434C	Internship: Biological Anthropology	1-6
ANTHR 445	Biological Field School	4-6

ANTHR 451C	Practicum in Anthropology: Biological Anthropology	1-3
ANTHR 490C	Independent Study: Biological Anthropology	1-5

As majors in the College of Liberal Arts and Sciences, Anthropology students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses.

Students in Anthropology have the option of pursuing a B.S. or a B.A. A B.S requires six additional group requirement credits in natural science or mathematics disciplines. A B.A. requires six additional group requirement credits in social or humanities disciplines.

Anthropology B.S., B.A.

Freshman

Fall	Credits Spring	Credits
ENGL 150	3 ANTHR 202	3
LIB 160	1 Minor choice	3
ANTHR 201	3 Social science choice	3
Elective	3 Natural science choice	3
Arts & Humanities choice	3 Arts & Humanities choice	3
Social science choice	3	
	16	15

Sophomore

Fall	Credits Spring	Credits
ANTHR 308	3 ANTHR 306	3
World Languages and Cultures/International Perspective	4 World Languages and Cultures/International Perspective	4
Humanities choice	3 ANTHR 300 choice	3
ENGL 250	3 Minor choice	3
ANTHR 300 choice	3 Natural science choice	3
LAS 203	1	
	17	16

Junior

Fall	Credits Spring	Credits
ANTHR 425	1 ANTHR 307	3

STAT 101	4 ENGL 300-level	3
Arts & Humanities choice	3 ANTHR 300	3
ANTHR 300 choice	3 Minor choice	3
Natural science choice	3 Additional Area requirement	3
	Summer: It is highly recommended that students complete a field school, internship, or study abroad experience during the summer between their junior and senior years however, this is not required for graduation.	

	14	15
Senior		
Fall	Credits Spring	Credits
ANTHR 450	3 ANTHR 300 choice	3
Minor choice	3 Minor choice	3
ANTHR 300 choice	3 Elective	3
Additional Area requirement	3 Elective	3
Electives	3	
	15	12

Minor

A minor in anthropology consists of at least 15 credits. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

ANTHR 201	Introduction to Cultural Anthropology	3
ANTHR 202	Human Origins	3

One of the following in cultural anthropology: 3

ANTHR 306	Culture and Interpretation	
or ANTHR 307	Introduction to Culture and Language	
or ANTHR 308	Peoples and Cultures of Native North America	
or ANTHR 309	Topics in Latin American Anthropology	
or ANTHR 310	Magic, Witchcraft, and Religion	

One of the following in archaeology or biological anthropology: 3

ANTHR 307	Biological Anthropology	
or ANTHR 308	Archaeology	
or ANTHR 310	Archaeology of North America	
or ANTHR 311	Skeletal Biology	
or ANTHR 312	World Prehistory	
or ANTHR 401	Topics in Biological Anthropology	

Three additional credits in ANTHR at the 300+ level 3

## Graduate Programs

The department offers a master of arts degree with a major in anthropology. Graduate courses are offered in the areas of archaeology, biological anthropology, and cultural anthropology. Competence in statistics or a methodology relevant to the student's program of study must be demonstrated. Students are required to do original field, archival, or laboratory research that will result in a scholarly thesis.

## Biochemistry and Biophysics

### Overview

The Roy J. Carver Department of Biochemistry, Biophysics and Molecular Biology (<https://www.bbmb.iastate.edu>) offers majors in biochemistry in the College of Liberal Arts and Sciences and in the College of Agriculture and Life Sciences. Biochemists seek to understand life processes in terms of chemical and physical principles. Students in the biochemistry majors develop foundational analytical skills while exploring frontiers in biotechnology and medicine. Graduates in biochemistry will have a rigorous background in chemistry, biology, and physics. Biochemistry coursework focuses on the development of problem-solving skills, critical thinking, communication, and research design. The Biochemistry degree includes focused specializations towards professional goals, including three prescribed options: **Research & Biotechnology**, **Pre-Medicine**, and **Biophysics**.

Graduates with a Biochemistry B.S. degree will be prepared for postgraduate studies in the chemical or biological sciences, medical and health professional training, or immediate laboratory research in biochemistry, biotechnology, or pharmacy. Graduates are also equipped to pursue careers in teaching, technical writing, science communication and policy, intellectual property law, and biotechnology entrepreneurship. The biochemistry major is accredited by the American Society for Biochemistry and Molecular Biology (ASBMB). As such our learning objectives align with ASBMB core concepts.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Explain and provide examples to illustrate the biochemical principles underlying the following:
  - a. How energy is required and transformed in biological systems.
  - b. How macromolecular structure determines function and regulation.
  - c. How information storage and flow are dynamic and interactive.
  - d. How biochemistry and biology are driven by evolution and homeostasis
- Apply and justify appropriate techniques to characterize and quantify biomolecules in biological systems.

- Execute effective multimodal communication of the research process and results.
- Implement and justify best practices for laboratory safety and research ethics.

## Biochemistry Major in the College of Liberal Arts and Sciences

The Bachelor of Science (B.S.) degree in Biochemistry requires the Biochemistry Core and one of the following three prescribed options. The options represent focused specializations for professional goals, including *Research & Biotechnology*, *Pre-Medicine*, and *Biophysics*. As majors in the College of Liberal Arts and Sciences, Biochemistry students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below. Focus option-approved science course lists can be found on the Biochemistry website (<https://www.bbmb.iastate.edu/approved-course-lists/>).

### Biochemistry Core

The major in biochemistry requires completion of the Biochemistry Core and one of three focus options. Each defined option includes specific supporting coursework in Biology; Chemistry; Mathematics and/or Statistics.

BBMB 101	Introduction to Biochemistry	1
BBMB 102	Introduction to Biochemistry Laboratory	1
BBMB 201	Chemical Principles in Biological Systems	2
BBMB 311	Writing Scientific Reports in Biochemistry <sup>1</sup>	1
BBMB 312	Experimental Research Skills in Biochemistry	2
BBMB 404	Biochemistry I	3-4
or BBMB 504 & BBMB 505	Amino Acids and Proteins and Bioenergetics and Metabolism	
BBMB 405	Biochemistry II	3-4
or BBMB 506 & BBMB 507	Membrane Biochemistry and Biochemistry of Nucleic Acids	
BBMB 410	Analysis of Scientific Literature	2
BBMB 411	Techniques in Biochemical Research	4
BBMB 461	Molecular Biophysics	2
BBMB 561L	Laboratory in Molecular Biophysics	2-3
or CHEM 322L	Laboratory in Physical Chemistry	
PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	5
PHYS 232 & 232L	Introduction to Classical Physics II and Introduction to Classical Physics II Laboratory	5



BBMB 499	Undergraduate Research (highly encouraged elective)	arr †
<b>Total Credits</b>		<b>33-36</b> †

† Arranged with instructor.

<sup>1</sup> BBMB 311 fulfills the ISU upper-level Communication Proficiency requirement.

### Biochemistry Program of Study: Research & Biotechnology

Students interested in careers in biotechnology research and/or graduate studies in biochemistry, chemistry, or bioscience fields may opt for the Research & Biotechnology Option.

In addition to the Biochemistry Core (above):

CHEM 201 or CHEM 177 & CHEM 178	Advanced General Chemistry General Chemistry I and General Chemistry II	5-7
CHEM 201L or CHEM 177N or CHEM 177L	Laboratory in Advanced General Chemistry Laboratory in General Chemistry I Laboratory in General Chemistry I	1
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
CHEM 333L or CHEM 331L	Laboratory in Organic Chemistry I (for Chemistry and Biochemistry Majors) Laboratory in Organic Chemistry I	1-2
CHEM 334L or CHEM 332L	Laboratory in Organic Chemistry II (for Chemistry and Biochemistry Majors) Laboratory in Organic Chemistry II	1-2
MATH 165 & MATH 166	Calculus I and Calculus II	8
MATH 265 or MATH 266 or MATH 267 or STAT 201 or STAT 305	Calculus III Elementary Differential Equations Elementary Differential Equations and Laplace Transforms Introduction to Statistical Concepts and Methods Engineering Statistics	3-4
BIOL 211	Principles of Biology I	3
BIOL 212	Principles of Biology II	3
BIOL 313 & 313L	Principles of Genetics and Genetics Laboratory	4
BIOL 314	Principles of Molecular Cell Biology	3

Molecular Sciences from approved list	3
<b>Total Credits</b>	<b>44-49</b>

### Biochemistry Program of Study: Pre-Medicine

Students interested in qualifying for medical school training for careers as a Doctor of Medicine (MD) or Doctor of Osteopathic Medicine (DO) may opt for the Pre-Medicine Option. Allied health professions (e.g., Physician's Assistant, Dentistry, and Ophthalmology) may also consider the Pre-Medicine Option.

In addition to the Biochemistry Core (above):

CHEM 177 & 177L & CHEM 178 & CHEM 178L or CHEM 201 & 201L	General Chemistry I and Laboratory in General Chemistry I and General Chemistry II and Laboratory in College Chemistry II Advanced General Chemistry and Laboratory in Advanced General Chemistry	6-9
CHEM 325	Chemical Thermodynamics	3
CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	4
CHEM 332 & 332L	Organic Chemistry II and Laboratory in Organic Chemistry II	4
MATH 165 & MATH 166	Calculus I and Calculus II	8
STAT 201 or STAT 305	Introduction to Statistical Concepts and Methods Engineering Statistics	3-4
PSYCH 101 or PSYCH 230	Introduction to Psychology Developmental Psychology	3
SOC 134	Introduction to Sociology	3
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 313	Principles of Genetics	3
BIOL 314	Principles of Molecular Cell Biology	3
Health & Biosciences from approved list		3
<b>Total Credits</b>		<b>51-55</b>

### Biochemistry Program of Study: Biophysics

Students interested in research careers focused on the biophysical basis of life processes may opt for the Biophysics Option. *The Biophysics major will be discontinued Fall 2023 pending Board of Regents State of Iowa approval; the Biochemistry major now has a formal program focus in biophysics.*

In addition to the Biochemistry Core (above):

CHEM 201	Advanced General Chemistry	5-7
or CHEM 177 & CHEM 178	General Chemistry I and General Chemistry II	
CHEM 201L	Laboratory in Advanced General Chemistry	1
or CHEM 177N	Laboratory in General Chemistry I	
or CHEM 177L	Laboratory in General Chemistry II	
CHEM 324	Introductory Quantum Mechanics	3
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
MATH 165 & MATH 166	Calculus I and Calculus II	8
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
MATH 317	Theory of Linear Algebra	4
COM S 207	Fundamentals of Computer Programming	3
BIOL 211	Principles of Biology I	3
BIOL 212	Principles of Biology II	3
Physical Sciences from approved list		3
<b>Total Credits</b>		<b>49-51</b>

As majors in the College of Liberal Arts and Sciences, Biochemistry students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to the requirements for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and LAS career proficiency requirement.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Four Year Plans

### Biochemistry B.S. Program of Study, College of Liberal Arts and Sciences

#### *Research & Biotechnology Option*

#### Sample Four-Year Plan

##### First Year

Fall	Credits	Spring	Credits
BBMB 101	1	BBMB 102	1
BBMB 110	1	BBMB 111	1
MATH 165	4	MATH 166	4
CHEM 177	4	CHEM 178	3
CHEM 177N	1	BIOL 211	3
LIB 160	1	General Education Elective	3
ENGL 150	3		
		<b>15</b>	<b>15</b>

##### Second Year

Fall	Credits	Spring	Credits
MATH 265, 266, 267, STAT 201, or STAT 305	3-4	BBMB 201	2
CHEM 331	3	CHEM 332	3
CHEM 331L	1	CHEM 332L	1
PHYS 231	4	PHYS 232	4
PHYS 231L	1	PHYS 232L	1
BIOL 212	3	ENGL 250	3
		BBMB 499	1
		LAS 203	1
		<b>15-16</b>	<b>16</b>

##### Third Year

Fall	Credits	Spring	Credits
BBMB 404	3	BBMB 405	3
BBMB 311*	1	BIOL 314	3
BBMB 312	2	BBMB 410	2
BIOL 313	3	BBMB 499	1
BIOL 313L	1	International Perspectives Elective	3
BBMB 499	1	General Education Elective	3
U.S. Diversity Elective	3		
General Education Elective	3		
		<b>17</b>	<b>15</b>

##### Fourth Year

Fall	Credits	Spring	Credits
BBMB 411	4	CHEM 325	3

BBMB 499	2 CHEM 322L or BBMB 461 <i>and</i> BBMB 561L	3-4	STAT 201	4 SOC 134	3
Upper-level Mol. Sciences Elective	3 BBMB 499	3	PHIL 235 <sup>1</sup>	3 International Perspectives Elective	3
General Education Elective	3 General Education Elective	3			
General Education Elective	3 General Education Elective	3			
	<b>15</b>	<b>15-16</b>		<b>16</b>	<b>15</b>

"General Education Electives" include credits in LAS-approved courses in *Arts & Humanities* and *Social Sciences*

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

### Biochemistry B.S. Program of Study, College of Liberal Arts and Sciences *Pre-Medicine Option* Sample Four-Year Plan

#### First Year

Fall	Credits Spring	Credits
BBMB 101	1 BBMB 102	1
BBMB 110	1 BBMB 111	1
MATH 165	4 MATH 166	4
CHEM 177	4 CHEM 178	3
CHEM 177N	1 CHEM 178L	1
LIB 160	1 BIOL 211	3
ENGL 150	3 BIOL 211L	1
	<b>15</b>	<b>14</b>

#### Second Year

Fall	Credits Spring	Credits
CHEM 331	3 BBMB 201	2
CHEM 331L	1 CHEM 332	3
PHYS 231	4 CHEM 332L	1
PHYS 231L	1 PHYS 232	4
BIOL 212	3 PHYS 232L	1
BIOL 212L	1 ENGL 250	3
PSYCH 101	3 LAS 203	1
	<b>16</b>	<b>15</b>

#### Third Year

Fall	Credits Spring	Credits
BBMB 404	3 BBMB 405	3
BBMB 311*	1 BIOL 314	3
BBMB 312	2 BBMB 410	2
BIOL 313	3 BBMB 499	1

#### Fourth Year

Fall	Credits Spring	Credits
BBMB 411	4 CHEM 325	3
BBMB 499	2 CHEM 322L or BBMB 461 <i>and</i> BBMB 561L	3-4
Upper-level Health or Mol. Biosci. Elective	3 BBMB 499	3
General Education Elective	3 General Education Elective	3
General Education Elective	3 General Education Elective	3
	<b>15</b>	<b>15-16</b>

"General Education Electives" include credits in LAS-approved courses in *Arts & Humanities* and *Social Sciences*. MCAT-recommended SOC 134 and PSYCH 101 apply towards *Social Sciences* requirement.

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

<sup>1</sup> Fulfills university U.S. Diversity requirement

### Biochemistry B.S. Program of Study, College of Liberal Arts and Sciences *Biophysics Option* Sample Four-Year Plan

#### First Year

Fall	Credits Spring	Credits
BBMB 101	1 BBMB 102	1
BBMB 110	1 BBMB 111	1
MATH 165	4 MATH 166	4
CHEM 177	4 CHEM 178	3
CHEM 177N	1 BIOL 211	3
LIB 160	1 General Education Elective	3
ENGL 150	3	
	<b>15</b>	<b>15</b>

#### Second Year

Fall	Credits Spring	Credits
MATH 265	4 BBMB 201	2
CHEM 331	3 CHEM 332	3
PHYS 231	4 PHYS 232	4
PHYS 231L	1 PHYS 232L	1
BIOL 212	3 ENGL 250	3

	LAS 203	1
	<b>15</b>	<b>14</b>
<b>Third Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 404	3 BBMB 405	3
BBMB 311 *	1 CHEM 325	3
BBMB 312	2 BBMB 410	2
COM S 207	3 MATH 317	4
U.S. Diversity Elective	3 BBMB 499	1
General Education Elective	3 General Education Elective	3
	<b>15</b>	<b>16</b>
<b>Fourth Year</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
BBMB 411	4 CHEM 324	3
STAT 305	3 CHEM 322L or BBMB 461 and BBMB 561L	3-4
BBMB 499	1 Upper-level Physical Sci. Elective	3
International Perspectives Elective	3 BBMB 499	1
General Education Elective	3 General Education Elective	3
General Education Elective	3 General Education Elective	3
	<b>17</b>	<b>16-17</b>

"General Education Electives" include credits in LAS-approved courses in *Arts & Humanities* and *Social Sciences*.

\* BBMB 311 fulfills the upper-level communication proficiency requirement.

## Minor

### The Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology offers a minor in Biochemistry.

BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
BBMB 312	Experimental Research Skills in Biochemistry	2
One course from the following:		2-3
BBMB 461	Molecular Biophysics (2 cr)	
BBMB 561	Molecular Biophysics (2 cr)	
CHEM 325	Chemical Thermodynamics (3 cr)	
300+ level courses in BBMB or CHEM to 15 cr total		5-6
<b>Total Credits</b>		<b>15-17</b>

All minors require at least 15 credits, including at least 6 credits in course numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Concurrent Programs

### Concurrent Bachelor of Science (B.S.)/ Master of Science (M.S.) Degrees

The department offers a concurrent enrollment degree program in either Biochemistry or Biophysics that allows ISU undergraduate students to obtain both the B.S. and M.S. degrees in about five years. The program is open to undergraduate students in the College of Liberal Arts and Sciences and in the College of Agriculture and Life Sciences. The concurrent degrees can be useful to students entering various career tracks. For those considering careers as research specialists, entry positions with higher-level responsibilities, and a higher-level salary, are made possible with the M.S. degree. For those considering careers as research directors, which require advanced study, the M.S. degree provides an advantage for admission into Ph.D. programs at the most competitive and prestigious graduate schools. Similarly, the M.S. degree can be a competitive advantage for admission in to medical, dental, law, veterinary medicine, or other professional schools.

Application to the program is made near the end of the junior undergraduate (third) year. Concurrent B.S./M.S. degree students begin research for the M.S. thesis during the summer semester after their junior year and are eligible for research assistantships, which are renewable based on academic standing and satisfactory research performance. The M.S. thesis requires intensive experience in original, independent laboratory research under the close supervision of a faculty mentor. To apply, see the concurrent B.S./M.S. application instructions found on the department's Graduate Study web page.

### Concurrent Bachelor of Science/Graduate Certificate

The Bachelor of Science /Graduate Certificate program is intended for exceptional undergraduate students majoring in Biochemistry. In this program, the student completes all of the requirements for the B.S. degree and the graduate certificate in a four-year period by combining the requirements of the two programs. The student enters the Graduate College after he/she achieves junior status and develops a plan of coursework (graduate and undergraduate) subject to the approval of the Director of Certificate (DOC). Required graduate courses are BBMB 504, 505, 506, 507, 561 and 561L. The student must satisfy the requirements of the B.S. in Biochemistry (121 credits) and the Graduate Certificate in Biochemistry (12 credits). Six credits of graduate coursework can satisfy some requirements of the B.S. degree. To apply for the B.S./Graduate Certificate, submit the application form found on the Graduate College Forms web page.

## Graduate Programs

### Introduction

Biochemistry and Biophysics are the science and technology used to understand the mechanisms underlying biological processes at the molecular level, with an emphasis on the fundamental relationships among the chemical, physical, and biological sciences. The Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology (BBMB) administers Doctor of Philosophy (Ph.D.), Master's (M.S.), and Graduate Certificate programs that lead to an advanced degree or certificate in these disciplines. The prerequisite to graduate study is a sound undergraduate background in biology, chemistry, mathematics, and physics.

BBMB offers Doctor of Philosophy and Master's degrees in Biochemistry and in Biophysics that are designed to train students to independently conceive and carry out original research. BBMB also offers two graduate certificate programs in Biochemistry that provide a mechanism for formal recognition of focused graduate study in a specialized area that is less comprehensive than that required for a master's degree. BBMB participates in the Interdepartmental majors of Bioinformatics and Computational Biology; Genetics and Genomics; Immunobiology; Molecular, Cellular, and Developmental Biology; Neuroscience; Plant Biology; and Toxicology. All graduate degree students in BBMB are required to teach as part of their training.

### Master of Science (M.S.) Degree

The M.S. degree programs in Biochemistry and in Biophysics are useful for students who prefer to undertake research training without the longer-term commitment required for the Ph.D. degree. It is also useful for students interested more in the technical aspects of research rather than in careers as research directors. The program requires about 3 years on average to complete and the successful defense of an independent research dissertation is required. About half the time required to earn the degree is spent on advanced coursework and professional seminars, and the other half is devoted to research undertaken in the laboratory under the close supervision of a faculty mentor. Financial support is available.

To apply, applicants first submit the free BBMB online application found on the department website, which is used as a screening tool.

NOTE: Students interested in a research career are encouraged to consider the Ph.D. track. Students may enter the Biochemistry or Biophysics M.S. degree program as a direct admit to a faculty research group at any time during the year.

### Doctor of Philosophy (Ph.D.) Degree

The Ph.D. programs in Biochemistry and in Biophysics are designed to train students in the ability to independently conceive and carry out original research in the general area of the chemistry or physics of the processes of life. The programs require about 5-6 years on average

to complete and the successful defense of an independent research dissertation. The majority of the time required to earn the degree is spent doing research on the dissertation project in the laboratory under the close supervision of a faculty mentor. Considerable time also is devoted to advanced coursework and professional seminars. Financial support is available. To apply, applicants first submit the free BBMB online application found on the department website, which is used as a screening tool. Students may enter the Biochemistry or Biophysics Ph.D. degree programs either as a rotation student in the fall semester or as a direct admit to a faculty research group at any time during the year.

### Graduate Minor in Biochemistry

Graduate students in other M.S. and/or Ph.D. programs at ISU can earn a graduate minor in Biochemistry by completing 12 credits of the following courses with a grade point average of 3.0 or above: at least 6 credits from BBMB 504, BBMB 505, BBMB 506 and BBMB 507 and at least 6 credits of other BBMB 500- and 600-level courses. A student wishing to declare a minor in Biochemistry should arrange for a member of the graduate faculty in Biochemistry to serve on the POS Committee and submit the required form found on the Graduate College Forms page.

### Graduate Certificate Programs

The graduate certificate program is designed for students who wish to continue or expand their knowledge in Biochemistry at the graduate level without the time commitment or lab experience required for a formal Master's or Ph.D. program. A certificate program can be an attractive option for individuals who have a bachelor's degree and are interested in broadening their expertise, or who are working in the sciences or industry and want to continue their education at the graduate level. BBMB offers two graduate certificate programs in Biochemistry: a concurrent B.S. / Graduate Certificate and a Graduate Certificate. The standards of admission and the course standards to which a certificate student are held are equivalent to those expected of a master's student. Each graduate certificate requires at least 12 graduate credits, all of which are available either on campus or on line. A graduate supervisor will be appointed to oversee the certification for each student.

If a person who completes a graduate certificate program decides to continue for a graduate degree in Biochemistry or Biophysics, program approval is required. Credits earned for the graduate certificate may be used to meet course requirements for the graduate degree program.

### Graduate Certificate in Biochemistry

The graduate certificate in Biochemistry is designed for students who have a B.S. degree in Biochemistry or a related field and wish to advance their knowledge by taking additional coursework at the graduate level.

The graduate certificate courses may be taken either on-line or on campus. Candidates for a graduate certificate in Biochemistry are admitted in the Graduate College. A total of 12 credits is required that include BBMB 504, BBMB 505, BBMB 506 and BBMB 507, plus four

additional credits of BBMB coursework at the 500-level. The 12 credits earned in the graduate certificate program may be applied to meet the course requirements of a M.S. or Ph.D. program in Biochemistry at Iowa State University (ISU) if the student is accepted into one of these programs. To apply for the graduate certificate in Biochemistry, submit the ISU online application.

## Bioinformatics and Computational Biology

Undergraduate study in BCBio is jointly administered by the Department of Computer Science, the Department of Genetics, Development, and Cell Biology, and the Department of Mathematics. The undergraduate B.S. degree is offered through the College of Liberal Arts and Sciences.

Bioinformatics and Computational Biology is an interdisciplinary science at the interfaces of the biological, informational and computational sciences. The science focuses on a variety of topics. These include gene identification, expression, and evolution; RNA, protein, and genome structure; and molecular and cellular systems and networks. The large group of participating faculty provides students with a multidimensional perspective on bioinformatics and computational biology and presents them with broad range of possibilities to get involved in research.

This major will prepare students for careers at the interfaces of biological, informational and computational sciences. BCBio graduates with a B.S. seeking direct employment will find ready markets for their talents in agricultural and medical biotechnology industries, as well as in academia, national laboratories, and clinics. Although some students find employment directly after their baccalaureate training, many students will continue their education in one of the many excellent graduate programs in bioinformatics and computational biology that now exist.

Participation in this field requires that students achieve a high level of competence not only in biology, but also in mathematics, computer science, and statistics. As a result, the program includes required courses from many different disciplines. Graduates demonstrate an above-average ability to synthesize methods from these different disciplines to solve problems.

### Student Learning Outcomes

By completing their studies, students earning the BS degree in BCBio are expected to:

1. Develop critical thinking skills by implementing the scientific method through bioinformatics data analysis.
2. Explain and complete simple applications of the common bioinformatics and computational biology methods used for DNA, RNA, and protein analysis.

3. Understand the central dogma of biology and how bioinformatic analyses of high throughput biological next-generation sequencing proteomics datasets can help answer fundamental questions about the biology of DNA, RNA, and proteins.

4. Define systems biology and explain its importance in understanding biology; undertake basic data analyses in systems biology.

5. Identify common formats for biological data and be able to convert among different formats.

6. Summarize fundamental bioinformatics software tools, know when to apply them, and be able to use them.

7. Combine existing software tools into bioinformatic data processing pipelines.

8. Evaluate the limits of traditional algorithms and data analysis techniques as they apply to big data in biology.

9. Identify and appraise noise in high throughput biological datasets and uncertainty in the conclusions of data analysis.

10. Interpret bioinformatics and computational biology analyses individually and in collaborative learning environments.

As majors in the College of Liberal Arts and Sciences, Bioinformatics and Computational Biology students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

#### A. Complementary Courses for the BCBio Major

A minimum of 5 credits from the following:

5-8

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry
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or

CHEM 177 & 177L & CHEM 178	General Chemistry I and Laboratory in General Chemistry I and General Chemistry II
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or

CHEM 201 & 201L	Advanced General Chemistry and Laboratory in Advanced General Chemistry
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A minimum of 4 credits from the following: 4-8

CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	
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or

CHEM 331 & 331L	Organic Chemistry I and Laboratory in Organic Chemistry I	
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and

CHEM 332 & 332L	Organic Chemistry II and Laboratory in Organic Chemistry II	
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5 credits from the following: 5

PHYS 115 & 115L	Physics for the Life Sciences and Laboratory in Physics for the Life Sciences	
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or

PHYS 131 & 131L	General Physics I and General Physics I Laboratory	
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or

PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	
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STAT 330	Probability and Statistics for Computer Science	3
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STAT 483	Empirical Methods for the Computational Sciences	3
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BIOL 211 & 211L	Principles of Biology I and Principles of Biology Laboratory I	4
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BIOL 212 & 212L	Principles of Biology II and Principles of Biology Laboratory II	4
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BIOL 314	Principles of Molecular Cell Biology	3
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or

BIOL 315	Biological Evolution	
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or

GEN 409	Molecular Genetics	
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**Total Credits 31-38**

Complementary courses note: The following other STAT courses may be substituted for STAT 330 and STAT 483, with permission of the BCBio Major.

STAT 330: STAT 101, 104, 201, 231, 305, or 341

STAT 483: STAT 301, 342, or 432

**B. Core Courses Within the BCBio Major**

GEN 313 & 313L	Principles of Genetics and Genetics Laboratory	4
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COM S 227 & COM S 228	Object-oriented Programming and Introduction to Data Structures (recommended when developing course plan)	7
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COM S 230	Discrete Computational Structures	3
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COM S 311	Introduction to the Design and Analysis of Algorithms	3
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MATH 165 & MATH 166	Calculus I and Calculus II (recommended when developing course plan)	8
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BCBIO 110	BCBIO Orientation	0.5
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BCBIO 322	Introduction to Bioinformatics and Computational Biology	3
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BCBIO 401	Bioinformatics of Sequences	3
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BCBIO 406	Bioinformatics of OMICS	3
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BCBIO 490 or BCBIO 491	Independent Study Team Research Projects	1-5
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**Total Credits 35.5-39.5**

Core courses note: The Com S 227/228 and Math 165/166 core course series is required for BCBio majors. However, students transferring into the major who have already earned credit for Com S 207/208 and/or the Math 181/182 can substitute those courses for the respective Com S 227/228 and/or Math 165/166 series. Students will need permission of the instructors to enroll in any upper level course that requires a pre-req in Com S 227/228 and/or Math 165/166.

**C. Support Electives**

3-9 credits to be chosen from the following list:

BBMB 404	Biochemistry I	3
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BBMB 405	Biochemistry II	3
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BBMB 461	Molecular Biophysics	2
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BIOL 328	Molecular and Cellular Biology of Human Diseases	3
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BIOL 423	Developmental Biology	3
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BIOL 451	Plant Evolution and Phylogeny	4
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BIOL 462	Evolutionary Genetics	3
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BIOL 487	Microbial Ecology	3
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COM S 252	Linux Operating System Essentials	3
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COM S 309	Software Development Practices	3
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COM S 319	Construction of User Interfaces	3
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COM S 327	Advanced Programming Techniques	3
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COM S 363	Introduction to Database Management Systems	3
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COM S 425	High Performance Computing for Scientific and Engineering Applications	3
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COM S 426	Introduction to Parallel Algorithms and Programming	4
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GEN 340	Human Genetics	3
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GEN 410	Analytical Genetics	3
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MATH 207	Matrices and Linear Algebra	3
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or MATH 317	Theory of Linear Algebra	
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
or MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 304	Combinatorics	3
MATH 314	Graph Theory	3
MATH 373	Introduction to Scientific Computing	3
MICRO 402	Microbial Genetics and Genomics	3
STAT 342	Introduction to the Theory of Probability and Statistics II	4
STAT 471	Introduction to Experimental Design	3
STAT 474	Introduction to Bayesian Data Analysis	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 486	Introduction to Statistical Computing	3
STAT 581	Analysis of Gene Expression Data for the Biological Sciences	3

D. The communications and English proficiency requirements of the LAS college are met by:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

And one of the following:

ENGL 309	Proposal and Report Writing	3
or		
ENGL 312	Communicating Science and Public Engagement	
or		
ENGL 314	Technical Communication	

BCBio majors must earn a minimum grade of C in ENGL 250 Written, Oral, Visual, and Electronic Composition or ENGL 250H Written, Oral, Visual, and Electronic Composition: Honors.

## Bioinformatics and Computational Biology, B.S.

### Freshman

Fall	Credits	Spring	Credits
BCBIO 110	0.5	BIOL 212	3
BIOL 211	3	BIOL 212L	1
BIOL 211L	1	CHEM 231	3
CHEM 163	4	CHEM 231L	1
CHEM 163L	1	MATH 166	4
MATH 165	4	LIB 160	1

ENGL 150	3 Humanities choice	3
	<b>16.5</b>	<b>16</b>

### Sophomore

Fall	Credits	Spring	Credits
BIOL 313	3	COM S 228	3
BIOL 313L	1	BIOL 314	3
BCBIO 322	3	PHYS 115	4
COM S 227	4	PHYS 115L	1
ENGL 250	3	Social Science choice	3
International Perspectives or U.S. Diversity	3	LAS 203	1
	<b>17</b>		<b>15</b>

### Junior

Fall	Credits	Spring	Credits
COM S 230 (or Cpr E 310)	3	COM S 311	3
STAT 330	3	STAT 483	3
ENGL 309 (or ENGL 312 or ENGL 314)	3	Bioinformatics Support Elective	3-9
MATH 265 (or other Support Elective)	4	Humanities choice	3
Humanities Choice	3	Social Science choice	3
	<b>16</b>		<b>15-21</b>

### Senior

Fall	Credits	Spring	Credits
BCBIO 401 (or BCBIO 444)	3	BCBIO 490 or 491	1-5
Humanities choice	3	BCBIO 406	3
World Language, if needed / Elective	3-4	World Language if needed or elective	4
COM S 363 (Recommended or other support elective)	3	International Perspectives or US Diversity	3
Social Science choice	3		
	<b>15-16</b>		<b>11-15</b>

**Total Credits: 121.5-132.5**

## Minor in Bioinformatics and Computational Biology

The administering departments offer a minor in Bioinformatics and Computational Biology, which requires the following courses.

BIOL 211	Principles of Biology I	3
BIOL 212	Principles of Biology II	3
GEN 313	Principles of Genetics	3
COM S 227 & COM S 228	Object-oriented Programming and Introduction to Data Structures	7
STAT 330	Probability and Statistics for Computer Science	3

BCBIO 322	Introduction to Bioinformatics and Computational Biology	3
BCBIO 401	Bioinformatics of Sequences	3
BCBIO 406	Bioinformatics of OMICS	3
Total Credits		28

Note: The following other STAT courses may be substituted for STAT 330, with permission of the BCBio Major: STAT 101, 104, 201, 231, 305, or 341

2. The Com S 227/228 course series is required for the BCBio minor. However, students transferring into the minor who have already earned credit for Com S 207/208 can substitute those courses for the Com S 227/228 series. Students will need permission of the instructors to enroll in any upper level course that requires a pre-req in Com S 227/228.

Most students pursuing a minor in Bioinformatics and Computational Biology will be biology, genetics, computer science, computer engineering, statistics, or mathematics students who have already taken some of these courses for their major. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Graduate Study

Work is offered for the master of science and doctor of philosophy degrees with a major in Bioinformatics and Computational Biology (BCB). Faculty are drawn from several departments: Agronomy; Animal Science; Astronomy and Physics; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Chemical and Biological Engineering; Chemistry; Computer Science; Ecology, Evolution, and Organismal Biology; Electrical and Computer Engineering; Entomology, Genetics, Development and Cell Biology; Materials Science and Engineering; Mathematics; Plant Pathology; Statistics; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The BCB program emphasizes interdisciplinary training in nine related areas of focus: Bioinformatics, Computational Molecular Biology, Structural and Functional Genomics, Macromolecular Structure and Function, Metabolic and Developmental Networks, Integrative Systems Biology, information Integration and Data Mining, Biological Statistics, and Mathematical Biology. Additional information about research areas and individual faculty members is available at: [www.bcb.iastate.edu](http://www.bcb.iastate.edu) (<http://www.bcb.iastate.edu>).

BCB students are trained to develop an independent and creative approach to science through an integrative curriculum and thesis research projects that include both computational and biological components. First year students are appointed as research assistants and participate in BCB 697 Graduate Research Rotation, working with three or more different research groups to gain experience in both “wet” (biological) and “dry” (computer) laboratory environments. In the

second year, students initiate a thesis research project under the joint mentorship of two BCB faculty mentors, one from the biological sciences and one from the quantitative/computational sciences. The M.S. and Ph.D. degrees are usually completed in two and five years, respectively.

Before entering the graduate BCB program, prospective BCB students should have taken courses in mathematics, statistics, computer science, biology, and chemistry. A course load similar to the following list would be considered acceptable:

MATH 265	Calculus III	4
STAT 341	Introduction to the Theory of Probability and Statistics I	4
COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
COM S 230	Discrete Computational Structures	3
CPR E 310	Theoretical Foundations of Computer Engineering	3
CHEM 163	College Chemistry	4
CHEM 231	Elementary Organic Chemistry	3
BBMB 301	Survey of Biochemistry	3
BIOL 313	Principles of Genetics	3
BIOL 315	Biological Evolution	3

During the first year, BCB students are required to address any background deficiencies in calculus, molecular genetics, computer science, statistics and discrete structures, with specific courses determined by prior training. Among the total course requirements for Ph.D. students are four core courses in Bioinformatics, three of which are mandatory in the BCB program:

BCB 567	Bioinformatics Algorithms (mandatory)	3
BCB 568	Statistical Bioinformatics (mandatory)	3
BCB 569	Structural Bioinformatics	3
BCB 570	Systems Biology (mandatory)	3

And also should include

GDCB 511	Advanced Molecular Genetics	
BCB 690	Student Seminar in Bioinformatics and Computational Biology	
BCB 691	Faculty Seminar in Bioinformatics and Computational Biology	
BCB 593	Workshop in Bioinformatics and Computational Biology	

M.S. students take the above background and core courses, take at least 6 credits of advanced coursework, and may elect to participate in fewer seminars and workshops. Additional coursework may be selected to satisfy individual interests or recommendations of the Program of Study Committee. All graduate students are encouraged to teach as

part of their training for an advanced degree. (For curriculum details and sample programs of study, see: [www.bcb.iastate.edu](http://www.bcb.iastate.edu) (<http://www.bcb.iastate.edu>)).

## Biological/Pre-Medical Illustration Overview

The interdepartmental undergraduate BPM I major is designed for students who want to combine their interests and aptitudes in science and art. Based on the theme of *Communicating Science Through Art*, the major prepares students for careers in biological visualization/illustration or for graduate education in medical visualization/illustration. Graduates enter fields such as biocommunications, environmental display design, freelance illustration, UX/UI and museum display design, creative technologies, instructional design, and various careers in the publishing, research and education, and visual communication industries.

### Student Learning Outcomes

Throughout its over 35-year existence, the underlying philosophy of BPM I has been to emphasize both art and science; students take approximately equal credit hours in the two major areas. Another important guiding principle has been visual thinking and problem-solving, and a third is maintaining student proficiency in a wide range of visual communication methods and technologies so they have the skill to choose the most effective tools for a given communication objective. Upon completion of the BPM I Program, graduates will:

- implement effective academic research methods and concept development processes for producing meaningful educational visual solutions
- demonstrate advanced science knowledge in a science focus area of choice (for example, pre-medical, or non-medical areas of life and earth science)
- demonstrate the ability to deconstruct and visualize complex science in order to create accessible, accurate, aesthetic, and meaningful visual representations, including diagrammatic, realistic, and symbolic, for a range of outputs (print, modeled, online, mobile)
- implement interdisciplinary thinking in team-based and independent projects
- flexibly adapt to new technology and communication challenges
- showcase and analyze works by articulating key visual elements in formal presentations, in written and oral format, and during assessments and critiques
- demonstrate effective use of design principles, problem solving skills, and visual organization
- demonstrate career-readiness and professional practice competencies
- exhibit an academic trajectory for engaging in life-long learning

## Entrance Requirements

Entrance into the BPM I program is by application to the BPM I Advisory Committee. Eligibility is based on an academic standard of at least 2.00 cumulative GPA on 30 credits of university level work and a consideration of artistic ability as demonstrated through submission of a portfolio of representative drawings or other art work. Freshman and transfer students usually declare pre-BPM I as their major while satisfying the conditions for entrance into the major, although other majors can be declared.

## Degree Requirements

The information below outlines the specific requirements for a BA degree in Biological/Pre-Medical Illustration (BPM I). There are four components to a degree in BPM I:

- Liberal arts general education
- Science core and advanced courses
- Art core and advanced courses
- Electives

### Part 1. College Requirements

#### a. Communication Proficiency Requirements

ENGL 150	Critical Thinking and Communication (grade of C or better)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (grade of C or better)	3
LIB 160	Introduction to College Level Research	1
Choose one course from the following:		3
ENGL 302	Business Communication	
ENGL 316	Creative Writing: Playwriting	
Two semesters of college-level world language		0-8
Students with 3 years in high school world language are exempt		
<b>Total Credits</b>		<b>10-18</b>

#### B. Liberal Arts and Sciences Requirements\*

Arts and Humanities **		12
Natural Sciences and Mathematical Disciplines		
MATH 104	Introduction to Probability	3-4
or MATH 140	College Algebra	
or MATH 143	Preparation for Calculus	
or MATH 165	Calculus I	
or STAT 101	Principles of Statistics	
or STAT 104	Introduction to Statistics	
or COM S 107	Windows Application Programming	
or more advanced		
CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry	5

or CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	
CHEM 231 & 231L	Elementary Organic Chemistry and Laboratory in Elementary Organic Chemistry	4
Social Sciences	***	9
<b>Total Credits</b>		<b>33-34</b>

\* Choose courses to meet International Perspectives & US Diversity requirements

\*\* See <https://las.iastate.edu/students/academics/general-education/>  
Consider HIST 280, HIST 281; ART H 280, ART H 281; DSN S 183

\*\*\* See <https://las.iastate.edu/students/academics/general-education/>

## Part 2. Course Requirements for Major in BPM I (continued in Part 3)

### A. Biological Sciences Core

LAS 293D or LAS 101	Special Projects: General (F.) Orientation for Open Option and Preprofessional Students	1
BIOL 211 & 211L	Principles of Biology I and Principles of Biology Laboratory I (F.S.)	4
BIOL 212 & 212L	Principles of Biology II and Principles of Biology Laboratory II (F.S.)	4
BIOL 255 & 255L or BIOL 256 & BIOL 255L or BIOL 313 & 313L or BIOL 335 & 335L or BIOL 350 or BIOL 351 or BIOL 365	Fundamentals of Human Anatomy and Fundamentals of Human Anatomy Laboratory Fundamentals of Human Physiology and Fundamentals of Human Anatomy Laboratory Principles of Genetics and Genetics Laboratory Principles of Human and Other Animal Physiology and Principles of Human and Other Animal Physiology Laboratory Comprehensive Human Anatomy Comparative Chordate Anatomy Vertebrate Biology	4-5
Note: BIOL 350, 351 and 365 courses include labwork.		
BIOL 356 or BIOL 366 or BIOL 451 or BIOL 454	Dendrology Plant Systematics Plant Evolution and Phylogeny Plant Anatomy	3-4
GEOL 102 & 102L or BIOL 312 or BIOL 315	History of the Earth and History of the Earth: Laboratory Ecology Biological Evolution	3-4
<b>Total Credits</b>		<b>19-22</b>

### B. Art Core

DSN S 131	Drawing I (F.S.)	4
ARTIS 230	Drawing II (F.S.)	3
ARTIS 233	Watercolor Painting (F.S.)	3
ARTIS 308	Computer Modeling, Rendering and Virtual Photography (F.S.)	3
ARTIS 330	Drawing III: Life Drawing (F.S.)	3
BPM I 323	Scientific Illustration Principles and Techniques (F.)	3
BPM I 326	Illustration and Illustration Software (S.)	3
BPM I 327	Illustration as Communication (F.)	3
BPM I 337	Application of Scientific Illustration Techniques (S.)	3
BPM I 497	Illustration Internship	1
<b>Total Credits</b>		<b>29</b>

Beyond the core preparation, students must take 9 credits in the advanced science area and 12 credits in the advanced art area. The courses acceptable in these areas follow. Other courses in art and biological science may be acceptable. See BPM I advisors and/or the BPM I Advisory Committee.

### C. Advanced Art Area

Select 12 total credits from below. At least 6 credits must be studio classes. Some courses can be considered either pre-med illustration or general art; speak with your advisor for guidance.

Pre-Med Illustration Area		
ARCH 335	Three-Dimensional Studio	3
ARTIS 330	Drawing III: Life Drawing	3
ARTIS 408	Principles of 3D Animation	3
ARTIS 430	Drawing IV (F.S.)	3
ARTIS 431	Character and Scene Design	3
ARTIS 432	Sequential Narrative Drawing	3
ARTIS 475	Interactive Art	3
ARTIS 482	Selected Topics in Studio Art	1-3
BPM I 323	Scientific Illustration Principles and Techniques	3
BPM I 326	Illustration and Illustration Software	3
BPM I 337	Application of Scientific Illustration Techniques	3
BPM I 490	Independent Study	1-3
BPM I 491	Portfolio Design and Professional Development (S.)	2
BPM I 494	Special Topics in Illustration	1-3
General Art Area		
ARTIS 213	Studio Fundamentals: Painting (F.S.)	2
ARTIS 227	Introduction to Creative Digital Photography	3

ARTIS 238	Painting I (F.S.)	3
ARTIS 329	Creative Photography	3
ARTIS 338	Painting II	3
ARTIS 356	Relief Printmaking: Digital/Traditional	3-4
ARTIS 357	Intaglio and Monotype Printmaking: Digital / Traditional	3-4
ARTIS 358	Lithography: Digital / Traditional	3
ARTIS 407	Principles of Character Animation	3
ARTIS 409	Computer/Video Game Design and Development	3
ARTIS 438	Painting III (F.S.)	3
ARTIS 473	Video Art	3
BPM I 395	Field Illustration (S.SS.)	1-3
BPM I 406X	Introduction to 3D Organic Modeling in ZBrush	3
BPM I 470X	Data, Code, and Form	3
JL MC 306	Broadcast Media Production (F.S.)	3
JL MC 315	Digital Storytelling (F.S.)	3
STAT 332	Visual Communication of Quantitative Information	3

#### D. Advanced Science Area

Select 9 credits total from below.

Pre-Med Illustration Science Area - required/recommended courses by most graduate schools

BBMB 316	Principles of Biochemistry (F.)	3
BIOL 313	Principles of Genetics (F.S.SS.)	3
BIOL 314	Principles of Molecular Cell Biology (F.S.)	3
BIOL 335	Principles of Human and Other Animal Physiology (S.)	3
BIOL 352	Vertebrate Histology (S.)	4
BIOL 423	Developmental Biology (S.)	3
B M S 329	Anatomy and Physiology of Domestic Animals (S.)	3
B M S 448	Principles of Human Gross Anatomy (S.)	4
GEN 340	Human Genetics (F.S.SS.)	3

#### General Science Area

A ECL 321	Fish Biology (S.)	3
A ECL 366	Natural History of Iowa Vertebrates (S.)	3
A ECL 457	Herpetology (F.)	2
A ECL 458	Ornithology (S.)	2
A ECL 459	Mammalogy (S.)	2
ANTHR 307	Biological Anthropology (S.)	3
ANTHR 319	Skeletal Biology (F.)	3
ANTHR 424	Forensic Anthropology (S.)	3
BBMB 301	Survey of Biochemistry (S.SS.)	3
BIOL 312	Ecology (F.SS. )	4
BIOL 255	Fundamentals of Human Anatomy	4

& 255L	and Fundamentals of Human Anatomy Laboratory	
BIOL 256 & 256L	Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	4
BIOL 313L	Genetics Laboratory (F.S.)	1
BIOL 315	Biological Evolution (F.S.)	3
BIOL 328	Molecular and Cellular Biology of Human Diseases (F.)	3
BIOL 336	Ecological and Evolutionary Animal Physiology	3
BIOL 350	Comprehensive Human Anatomy (F.)	4
BIOL 346X	Human Physiology for Health Assessment (plus 346L)	
BIOL 351	Comparative Chordate Anatomy	5
BIOL 353	Introductory Parasitology (S.)	3
BIOL 354	Animal Behavior (F.)	3
BIOL 355	Plants and People (S.)	3
BIOL 356	Dendrology (F.)	3
BIOL 364	Invertebrate Biology (F)	3-4
BIOL 365	Vertebrate Biology (F.)	4
BIOL 366	Plant Systematics (S.)	4
BIOL 393	North American Field Trips in Biology	1-4
BIOL 394	International Field Trips in Biology	1-4
BIOL 402	Introduction to Pathology (F.)	3
BIOL 430	Principles of Plant Physiology	3
BIOL 436	Neurobiology (F.)	3
BIOL 451	Plant Evolution and Phylogeny	4
BIOL 454	Plant Anatomy (F.)	4
BIOL 455	Bryophyte and Lichen Biodiversity	3
BIOL 456	Principles of Mycology (F.)	3
BIOL 474	Plant Ecology (S.)	3
BIOL 488	Identification of Aquatic Organisms (F.S.)	1
BPM I 395	Field Illustration (S.SS.)	1-3
DS 201	Introduction to Data Science	3
DS 202	Data Acquisition and Exploratory Data Analysis	3
ENT 370	Insect Biology (F.)	3
ENT 374	Insects and Our Health (S.)	3
GEOL 102	History of the Earth	3
GEOL 103	Age of Dinosaurs	1
GEOL 108	Introduction to Oceanography	3
GEOL 111	Geological Disasters	1
GEOL 140	Climate and Society	3
GEOL 160	Water Resources of the World	3
GEOL 324	Energy and the Environment	3



GEOL 412	Micropaleontology	3
GEOL 415	Paleoclimatology	3
MICRO 302	Biology of Microorganisms (F.S.SS.)	3
MICRO 302L	Microbiology Laboratory (F.S.)	1
MICRO 310	Medical Microbiology (F.)	3
MTEOR 206	Introduction to Weather and Climate	3
MTEOR 360	Ocean-Atmosphere Interactions	3
MTEOR 404	Global Change	3
NREM 301	Natural Resource Ecology and Soils (F.)	4
NREM 330	Principles of Interpretation (S.)	3
PSYCH 310	Brain and Behavior (F.S.)	3
V PTH 401	Basics of Medical Terminology (F.)	1

As majors in the College of Liberal Arts and Sciences, Biological/Pre-Medical Illustration students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Biological/Pre-Medical Illustration, B.A. 120 minimum credits required.

### Freshman

Fall	Credits	Spring	Credits	Summer	Credits
LAS 101		1 LIB 160		1 Prepare application for BPMI entry / apply during second year	
ENGL 150		3 Humanities		3 Consider taking a science course over the summer	
CHEM 163		4 BIOL 212		3	
CHEM 163L		1 BIOL 212L		1	

BIOL 211	3 ARTIS 230	3
BIOL 211L	1 Soc Sci Choice	3
DSN S 131	4 CHEM 231 & 231L or STAT or MATH	3-4
<b>17</b>		<b>17-18</b>
		<b>0</b>

### Sophomore

Fall	Credits	Spring	Credits	Summer	Credits
Foreign Lang. or Humanities (ART 280)		3-4 For Lang or Social Sci		3-4 Consider study abroad, or attending summer AMI / GNSI Conferences and enrolling in Art/ Science/ Techniques Workshops or Iowa Lakeside Lab to take advanced biology courses	
CHEM 231 & 231L or STAT or MATH		3-4 BPM I 326		3 Consider conducting BPMI 497 Internship over the summer	
BPM I 323		3 ARTIS 330		3	
ENGL 250		3 Humanities		3	
Science Core Course		3-4 Science Core Course		3-4	
LAS 203		1			
<b>16-19</b>		<b>15-17</b>		<b>0</b>	

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits
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BPM I 327		3 BPM I 337		3 Work with BPMI Advisory Committee to fine tune/plan senior portfolio	
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Advanced Science or Science Core Course	3-4	Science Core Course or Advanced Science		3-4 If planning to attend graduate school, take GRE over the summer, or at the latest in the fall, and prepare up to 20 portfolio pieces for submission over the summer and fine tune in the fall	
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ARTIS 308		3 Soc Sci		3	
Humanities or Social Sci		3 ARTIS 233		3	
Advanced Science or Art		3 Humanities and Advanced Art		3	

Consider taking BPMI 491, Portfolio Design and Professional Development, to begin preparing for post-graduation steps

**15-16****15-16****0****Senior**

Fall	Credits	Spring	Credits
Advanced Science	3-5	Advanced Science	3-4
Advanced Art	3-6	Advanced Art	3-6
Humanities/Social Elective	3	Humanities/Social Sci/Elective	3-6
BPMI 497	1	Advance English or Elective (ENGL 302 through ENGL 316 count as Advanced English)	3
Advanced English or Elective	2-3		

**12-18****12-19****Minor**

A minor in biological/pre-medical illustration is offered. A minimum of 17 credits must be taken, including 8 credits in biological science courses and 9 credits in art and design courses. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

The biological sciences must include:

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1

BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1

The art and design courses must include:

BPM I 323	Scientific Illustration Principles and Techniques	3
BPM I 337	Application of Scientific Illustration Techniques	3
Advanced drawing, illustration, electronic media or painting course		3

For more information, contact the BPM I advisor or view the website listed above.

## Biology

### Interdepartmental Undergraduate Program

Iowa State University is a major center for research and education in the biological sciences. With over 200 faculty in the life sciences, students have the opportunity to learn from some of the nation's leaders in biological research and teaching and to participate in innovative, meaningful research projects that explore frontiers of biology. Few other universities have such a wealth of faculty expertise available to undergraduate students, making Iowa State's Biology Program the logical choice for those who want to participate in a thriving academic community.

The faculties of the Department of Ecology, Evolution, and Organismal Biology and the Department of Genetics, Development, and Cell Biology jointly offer the undergraduate biology major. This high quality academic program has the flexibility to accommodate a range of career goals while taking advantage of the university's strengths in science and technology. A bachelor's degree in biology provides excellent preparation for graduate study in biological disciplines ranging from the molecular to the ecological levels, and for entrance into various professional schools, such as human medicine, physical therapy, or veterinary medicine. The major is well suited for those who plan to teach biology, who wish to enter government or industrial employment in health or environmental professions, or who prefer educational breadth as an end in itself. By working with our professional advisors, it is possible to design a unique program of study that will meet student needs and objectives.

Students with special interests and aptitudes should consider combining biology with a minor or a second major in another subject, such as chemistry, environmental studies, journalism, mathematics, music, statistics, or many other subjects offered by the university.

### Customizing a degree

Biology encompasses an amazing diversity of disciplines and scales of study ranging from molecules to the biosphere. The Biology major offers a rich variety of coursework addressing most of the areas of biology.

The major's curriculum requirements offer tremendous flexibility in creating an individualized program of study to facilitate achievement of a student's career goals, while simultaneously assuring some exposure to all areas of biology and providing complementary knowledge from supporting courses in chemistry, physics, and math/statistics.

While flexibility is the hallmark of the Biology major, the breadth of the field can also be challenging. Thus, in an effort to provide more guidance to students who desire such, the major also provides six advising tracks, or areas of specialization, for students who wish to focus on subfields of biology or who have specific career goals in mind. Course plans for each area of specialization are listed on the Biology web site. The areas are:

**Pre-medical and Human Health Professions**—This area emphasizes preparation for further study in medical school or allied human health professions such as dentistry, optometry, genetic counseling, physical therapy, occupational therapy, physician assistant, nursing, chiropractic, and others. It also will prepare students for a broad range of careers in the biological sciences. Students are urged to determine the specific entrance requirements for the professional schools where they might study and to plan a program of study accordingly, in addition to following the basic plan.

**Pre-veterinary**—An eventual degree in Veterinary Medicine can lead to a wide variety of careers, including private clinical practice in small animal medicine or agricultural animal production. But, pre-veterinary students can also prepare themselves for careers in animal research, public health, laboratory animal medicine, food safety, regulatory medicine, and education. Specific requirements for entrance to the Iowa State Veterinary College or other schools should be consulted as programs of study are planned, in addition to following the basic plan.

**Molecular and Cellular Biology**—Students specializing in this field will explore the structure, function, and interactions of the molecules and sub-cellular features that make up living cells. This area is particularly designed for those who plan to pursue a career in research in molecular or cell biology or in related areas such as biochemistry, genetics, microbiology, developmental biology, human medicine, or veterinary medicine. Many students in this area will choose to go on to graduate school.

**Ecology and Conservation Biology**—Ecologists examine the interactions and relationships that living organisms have with each other and their environment. Conservation biologists study the nature and status of Earth's biodiversity with the aim of protecting species, their habitats, and ecosystems from excessive rates of extinction and loss. Students who choose this specialization may go on to work for a non-profit environmental group; an environmental consulting firm; a local, state, or federal agency; or other related organizations. Many students in this area will choose to go on to graduate school.

**Evolution and Biodiversity**—This area provides students with a sound understanding of evolutionary principles and the biological patterns that result from evolutionary change. Students have the opportunity to explore, in depth, the biodiversity found within a wide range of groups of organisms. Students who choose this specialization may go on to work for a non-profit environmental group; an environmental consulting firm; a local, state, or federal agency; or other related organizations. Many students in this area will choose to go on to graduate school.

**Teacher licensure**—Biology majors seeking recommendation for licensure to teach biology in secondary schools must meet requirements of the Teacher Education Program as well as those of the Biology Program. In addition, they must apply formally for admission to the teacher education program. See the section on Teacher Education for a list of licensure areas, degree requirements, and other information about this program.

## Other opportunities

**Undergraduate research**—Students who have interests in biological research are encouraged to become involved in the research projects of faculty members on campus. Those doing so may receive credit for the experience in BIOL 499 Undergraduate Research Experience.

Making the effort to find a suitable research mentor and engaging in research work can be one of the most valuable experiences of an undergraduate education. Internship experiences are often available at other universities, zoos, museums, governmental and non-governmental entities focused on environmental issues, and industrial or government laboratories. Students participating in such projects may receive internship credit in BIOL 494 Biology Internship.

**Field trip courses** – The Biology Program offers two field trip courses: BIOL 393 (North American Field Trips in Biology) and BIOL 394 (International Field Trips in Biology). In recent years field trip opportunities to Honduras and Spain have been available. These courses involve a pre-trip seminar followed by one-week to one-month long field trip at a time when academic year classes are not in session. The classes are low enrollment and allow extensive interaction between instructors and students in locations of biological interest.

**International experience**—Because major discoveries in science often result from global efforts, biology majors are encouraged to include an international or study abroad component in their degree programs. This can be done by participating in international field trips originating from the ISU campus in BIOL 394 International Field Trips in Biology. In addition, many students choose to study abroad, attending a university in another country for up to a year as an exchange student. Minors in a foreign language can also add an international emphasis to a degree in biology.

## Courses offered at other locations

In addition to biological science courses taught on campus, students may take courses at various remote locations and arrange to have the credits count toward the advanced courses required in the biology major.

Attending a summer field station adds an important component to an undergraduate program of study.

**Gulf Coast Research Laboratory**—The Gulf Coast Research Laboratory is affiliated with the University of Southern Mississippi. Iowa State students may register for marine biology courses and transfer credit to their degree programs under the number BIOL 480 Studies in Marine Biology. Written permission of the Biology Program Director is required for this arrangement.

**Summer Biological Field Stations**—Courses taken at summer field stations may be transferred to Iowa State University as credit in BIOL 481 Summer Field Studies. Such stations are found throughout the country and often offer courses that emphasize the adaptation of plants and animals to unique environments. See [www.biology.iastate.edu](http://www.biology.iastate.edu) (<http://www.biology.iastate.edu/>) for links to Iowa Lakeside Laboratory and other field stations in different biomes, e.g., marine/coastal, Great Lakes, taiga, deciduous forests, deserts, Rocky Mts., etc.

**Organization for Tropical Studies**—Iowa State students may register for courses in tropical biology taught in Costa Rica by the Organization for Tropical Studies. Credit is transferred to Iowa State as BIOL 482 Tropical Biology. For further information, contact the Biology Student Services Office in 103 Bessey Hall.

## Student Learning Outcomes

Upon graduation, students should be able to:

- Explain and apply the core biological concepts of:
  - Evolution
  - Structure and function
  - Information flow, exchange, and storage
  - Pathways and transformations of energy and matter
  - How systems are interconnected and interact
- Apply the process of science
- Use quantitative reasoning
- Use modeling and simulation
- Utilize, communicate with, and collaborate with other disciplines
- Understand the relationship between science and society

## Undergraduate Study

Biology majors start their studies in the biological sciences by taking a two-semester long Principles of Biology course sequence:

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1

During the first year, students also take BIOL 110 Introduction to Biology and BIOL 111 Opportunities in Biology, which are half-semester courses designed to introduce the student to the discipline of biology and opportunities for careers in biology. Students transferring into the Biology major take BIOL 112 in place of BIOL 110 and BIOL 111.

Students then explore, in any order depending on their interests, four upper-level core courses including: concepts of ecology in BIOL 312; the principles of genetics in BIOL 313 and BIOL 313L; cell and molecular biology in BIOL 314; and evolutionary biology in BIOL 315. Biology majors must take an additional 21 credits of advanced biological science courses at the 300 level, or above, from an approved list of courses. Many of these courses have as prerequisites BIOL 211/L and BIOL 212/L, so students do not need to complete the four upper-level core courses before taking advanced courses. Of these advanced courses, at least 9 credits must be taken as BIOL courses, and a minimum of two laboratory or field courses must also be included from an approved list.

Biology majors should carefully consider their selection of upper-level courses to allow them to emphasize one, or more, of the sub-disciplines of Biology relevant to their post-baccalaureate objectives. Most biology courses numbered 300 or above can be used to satisfy the additional credit requirement. Some courses taught in other departments can also be applied to the biology major. Advanced students should consider including 500 level courses in their programs. The Biology Program's web site has a complete listing of acceptable upper-level life science courses.

Biology majors must demonstrate competency in their understanding of the biological sciences. A 2.0 cumulative average is required in biology and advanced biology coursework. In order to graduate, a student must have a cumulative average in the major of at least 2.00.

## General requirements

Students may earn the B.S. degree in Biology from either the College of Liberal Arts and Sciences or from the College of Agriculture and Life Sciences. Students in the College of Liberal Arts and Sciences must fulfill the College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated for the major. Students in the College of Agriculture and Life Sciences must meet University-wide requirements for graduation and requirements for that college. Contact the Student Services Office for details regarding differences in general education and course requirements that are specific to these colleges.

Supporting course requirements – Understanding biology requires a basic understanding of the physical sciences and mathematics. Consequently, a minimum number of credits in general chemistry, organic chemistry, biochemistry, and physics is required. See the Biology Program Web Site for specific supporting science requirements.

The Math requirement is competency based. After demonstrating competency in algebra and trigonometry, biology majors must take two semesters of calculus; or two semesters of Statistics; or one semester of calculus and one semester of Statistics chosen from a list of approved courses available on the Biology Program Web Site and in the Biology Program Office.

Given the important role of communications in the modern sciences, biology majors must demonstrate communication competency by earning a minimum of C in ENGL 250 Written, Oral, Visual, and Electronic Composition or equivalent composition courses and in one advanced writing course numbered ENGL 302 through ENGL 316, or JL MC 347, or SP CM 212. (Students in the College of Agriculture and Life Sciences are required to earn a C or better in ENGL 150, as well.)

## Curriculum in Biology

Administered by the Departments of Ecology, Evolution, and Organismal Biology; and Genetics, Development and Cell Biology. Students should consult the Biology Student Services Office, 103 Bessey (or biology@iastate.edu) for the appropriate course selections for professional or graduate school preparation.

### Total Degree Requirement: 120 cr.

Only 65 cr. from a two-year institution may apply which may include up to 16 technical cr.; 9 P-NP cr. of free electives; 2.00 minimum GPA.

### Biology: 23.5 cr.

2.00 GPA average required.

BIOL 110	Biology Major Orientation	1
BIOL 111	Opportunities in Biology	0.5
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
BIOL 312	Ecology	4
BIOL 313	Principles of Genetics	3
BIOL 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 315	Biological Evolution	3

**Total Credits** **23.5**

**Advanced Biology: 21 cr.**

2.00 GPA average required. Must include two approved Advanced Biology labs. See the Biology Program website for list of approved Advanced Biology courses, or consult an advisor in the Biology Student Services office, 103 Bessey Hall.

Biology advanced courses (from approved list)	9
Additional approved biology advanced courses	12
<b>Total Credits</b>	<b>21</b>

**Mathematical Sciences 7 cr.**

Students in College of Agriculture and Life Sciences must have a Math and Statistics.

MATH 160 or MATH 165 and STAT 101 or STAT 104	
Or	
MATH 165      Calculus I	8
& MATH 166      and Calculus II	
Or	
STAT 101 or STAT 104 and STAT 301	4-7

**Physical Sciences**

General Chemistry: 5 cr. minimum

CHEM 163      College Chemistry	5
& 163L          and Laboratory in College Chemistry	
Or	
CHEM 177      General Chemistry I	5
& 177L          and Laboratory in General Chemistry I	
CHEM 178      General Chemistry II	4
& 178L          and Laboratory in College Chemistry II	

Organic Chemistry: 4 cr. minimum

CHEM 231      Elementary Organic Chemistry	4
& 231L          and Laboratory in Elementary Organic Chemistry	
Or	
CHEM 331      Organic Chemistry I	4
& 331L          and Laboratory in Organic Chemistry I	

Biochemistry: 3 cr.

BBMB 316      Principles of Biochemistry	3
Or	
BBMB 404      Biochemistry I	3
Or	
BBMB 420      Mammalian Biochemistry	3

Physics: 5 cr. minimum

PHYS 115      Physics for the Life Sciences	5
& 115L          and Laboratory in Physics for the Life Sciences	
Or	

PHYS 131      General Physics I	5
& 131L          and General Physics I Laboratory	
PHYS 132      General Physics II	5
& 132L          and General Physics II Laboratory	

**International Perspective: 3 cr.****U.S. Diversity: 3 cr.****Communication/Information Literacy**

Students must earn a C or better in ENGL 250 and the advanced communication course. Additionally, students in the College of Agriculture and Life Sciences must earn a C or better in ENGL 150. Students should consult their advisor to discuss advanced communication course options other than SP CM 212.

ENGL 150      Critical Thinking and Communication	3
ENGL 250      Written, Oral, Visual, and Electronic Composition	3
LIB 160        Introduction to College Level Research	1
SP CM 212      Fundamentals of Public Speaking	3
<b>Total Credits</b>	<b>10</b>

**Humanities and Social Sciences**

Chosen from approved lists.

LAS - Biology

Note: Students must have completed 3 years of a single world language or take 4-8 credits of university level world language.

Humanities	12
Social Sciences	9
Career Preparation (LAS 203)	1
<b>Total Credits</b>	<b>22</b>

**Humanities and Social Sciences**

Chosen from approved lists.

CALS - Biology

Note: Students in CALS - Biology must take an approved speech course and an approved Math and Statistics course.

Humanities	3
Social Sciences	3
Ethics	3
<b>Total Credits</b>	<b>9</b>

**Biology Teacher Preparation Focus**

Biology majors seeking certification to teach Biology in secondary schools follow the requirements of the B.S. degree in Biology. In addition, they must take the complementary coursework listed below and meet all of the requirements of the Secondary Major in Education including EDUC 417, student teaching.



Complementary Coursework

PSYCH 230	Developmental Psychology	3
EDUC 418	Secondary Science Methods I	3
EDUC 419	Secondary Science Methods II	3
One course in American History or Government		3

Some students decide to complete the biology major and continue their studies as graduate students in Iowa State’s Science Education, Masters of Teaching (M.A.T.) program (<https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/educator-prep-programs-for-licensure-recommendation/science-education-m-a-t/>).

Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

Biology, B.S. (College of Liberal Arts and Sciences)

General Sample Plan

Freshman

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 Chemistry *		4	
BIOL 211L		1 Social Science		3	
CHEM 163 or 177 *		4 Math/Stat Choice *		4	
CHEM 163L or 177L *		1			
ENGL 150 or 250		3			
LIB 160		1			
14.5		15		0	

Sophomore

Fall	Credits	Spring	Credits
ENGL 250 (or Elective or World Language)		3 BIOL 313	3
BIOL 314		3 BIOL 313L	1
Chemistry or Elective *		3-4 Biochemistry *	3
Advanced Biology		3 World Language/ Elective	4
LAS 203		1 Math/Stat Choice *	4
Humanities Choice		3 Elective	1

16-17
 16

Junior

Fall	Credits	Spring	Credits
BIOL 312		4 BIOL 315	3
Advanced Biology		3 Advanced Biology with Lab	4
PHYS 115 or 131		4 PHYS 132 (or Elective)	4
PHYS 115L or 131L		1 PHYS 132L (or Elective)	1
International Perspectives + Humanities Choice		3 US Diversity + Social Science Choice	3

15
 15

Senior

Fall	Credits	Spring	Credits
Advanced Biology		3 Advanced Biology with Lab	4
Written Communication/ Speech		3 Advanced Biology	4
Social Science		3 Humanities Choice	3

Humanities	3 Elective or	3
Choice	Minor	
Elective or	3	
Minor		
<b>15</b>		<b>14</b>

**Total Credits: 120.5-121.5**

This is only a suggested outline plan. Students may choose or be forced to deviate from this plan to satisfy unmet requirements, for scheduling reasons, or to add a minor or double major. We strongly suggest student involvement in internships, study abroad, summer field stations, Iowa Lakeside Lab, Field Trips in Biology or research opportunities at ISU. These will enhance your program of study but may add credits or time to your degree plan.

\* Students should meet with a Biology Program advisor to determine the proper plans for chemistry, math and physics before selecting those options above.

**Biology, B.S. (College of Liberal Arts and Sciences)**
**Pre-Medical Sample Plan**

Please note that professional school requirements vary by program.

**Freshman**

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 CHEM 178		3	
BIOL 211L		1 CHEM 178L		1	
CHEM 177		4 MATH 160 or 165		4	
CHEM 177L		1 PSYCH 101		3	
ENGL 150 or 250		3			
LIB 160		1			
<b>14.5</b>		<b>15</b>		<b>0</b>	

**Sophomore**

Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology Choice	3
CHEM 331		3 BIOL 313	3
CHEM 331L		1 BIOL 313L	1
ENGL 250 (or Elective)		3 CHEM 332	3
STAT 104 or 101		3-4 CHEM 332L	1
LAS 203		1 USD + Arts and Humanities Choice	3
FS HN 367		1 Social Science Choice	3
<b>15-16</b>		<b>17</b>	

**Junior**

Fall	Credits	Spring	Credits
BBMB 316 or 404		3 BBMB 405 (Or Advanced Biology Choice)	3
BIOL 350		4 BIOL 335	3
SOC 134		3 BIOL 335L	1
PHYS 131		4 Elective	1
PHYS 131L		1 PHYS 132 PHYS 132L Take MCAT in May or June Submit application in June or July	4 1
<b>15</b>		<b>13</b>	

**Senior**

Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3

BIOL 312 (with lab)	4 BIOL 315	3
Written Communication/ Speech	3 Arts & Humanities Choice	6
Arts & Humanities + IP Choice	3 World Lang or Elective	3-4
World Lang or Elective Choice	3-4	
16-17		15-16
Total Credits: 120.5-123.5		

Biology, B.S. (College of Liberal Arts and Sciences)

Pre-Physician Assistant Sample Plan

Please note that professional school requirements vary by program.

Freshman

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 CHEM 178		3	
BIOL 211L		1 CHEM 178L		1	
CHEM 177		4 MATH 160 or 165		4	
CHEM 177L		1 PSYCH 101		3	
ENGL 150 or 250		3			
LIB 160		1			
14.5		15		0	

Sophomore

Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology Choice	3

CHEM 231	3 BIOL 313	3
CHEM 231L	1 BIOL 313L	1
Or CHEM 331 & CHEM 331L	Elective	3
ENGL 250 (or Elective)	3 Humanities Choice	3
STAT 104 or 101	3-4 PSYCH 230	3
LAS 203	1	
FS HN 367	1	
15-16		16

Junior

Fall	Credits	Spring	Credits
BBMB 316		3 Advanced Biology	3
BIOL 312		4 BIOL 335	3
BIOL 350		4 BIOL 335L	1
Elective		1 US Diversity + Humanities	3
PSYCH 460		3 PHYS 115/ L or PHYS 131/L	5
15		15	

Senior

Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3
Written Communication/ Speech		3 Elective Choice	3
BIOL 315		3 Arts & Humanities Choice	3
IP + Humanities Choice		3 Social Science	3

World Lang or Elective Choice	3-4 World Lang or Elective	3-4
<b>15-16</b>	<b>15-16</b>	

**Total Credits: 120.5-123.5**

### Biology, B.S. (College of Liberal Arts and Sciences)

## Pre-Physical Therapy Sample Plan

Please note that professional school requirements vary by program.

### Freshman

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 110		1 BIOL 212		3 All Summers: Consider internship, study abroad, field stations, research, clinical observation	
BIOL 111		0.5 BIOL 212L		1	
BIOL 211		3 CHEM 178		3	
BIOL 211L		1 CHEM 178L		1	
CHEM 177		4 MATH 160 or 165		4	
CHEM 177L		1 PSYCH 101		3	
ENGL 150 or 250		3			
LIB 160		1			
<b>14.5</b>		<b>15</b>		<b>0</b>	

### Sophomore

Fall	Credits	Spring	Credits
BIOL 314		3 Advanced Biology	3
CHEM 231		3 BIOL 313	3
CHEM 231L		1 BIOL 313L	1
ENGL 250 (or Elective)		3 Elective	2
STAT 101 or 104		3-4 Humanities Choice	3

LAS 203	1 Social Science (Psych course recommended)	3
FS HN 367	1	
<b>15-16</b>	<b>15</b>	

### Junior

Fall	Credits	Spring	Credits
BBMB 316		3 Advanced Biology	3
Humanities Choice		3 BIOL 335	3
BIOL 350		4 BIOL 335L	1
PHYS 131		4 Arts & Humanities + USD Choice	3
PHYS 131L		1 PHYS 132 PHYS 132L	4 1
<b>15</b>		<b>15</b>	

### Senior

Fall	Credits	Spring	Credits
Advanced Biology Choice		3 Advanced Biology Choice	3
Written Communication/ Speech		3 Elective	3
BIOL 312 (with lab)		4 BIOL 315	3
Arts & Humanities + IP Choice		3 Social Science	3
World Lang or Elective Choice		3-4 World Lang or Elective	3-4

<b>16-17</b>	<b>15-16</b>
<b>Total Credits: 120.5-123.5</b>	

## Minor

A minor in Biology is offered by the Biology Program. The minor requires 15 credits in Biology and includes the completion of the specific courses listed below and 7 credits in biology courses numbered 300 or above. Nine (9) credits of the required courses must apply only to the minor.

For more information, see the Biology Program web site or contact the Student Services Office in 103 Bessey Hall.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
<b>Total Credits</b>		<b>8</b>

## Graduate Programs

Biology is an undergraduate major only. Persons interested in graduate study in the biological sciences should apply directly to one of the life science graduate programs at Iowa State University.

### Programs

- Bioinformatics and Computational Biology
- Ecology and Evolutionary Biology
- Genetics
- Molecular Cellular and Developmental Biology
- Neuroscience
- Plant Biology
- Toxicology
- Immunobiology
- Environmental Science

### Interdisciplinary Graduate Studies

A non-thesis master's degree in Interdisciplinary Graduate Studies (biological sciences) has been established particularly for those who wish to have a more diversified program of advanced study than that generally permitted by specific departments and programs.

## Chemistry Overview

The department of Chemistry offers Bachelor of Science and Bachelor of Arts degrees in Chemistry in the College of Liberal Arts and Sciences.

Graduates holding the B.S. degree in Chemistry qualify in many fields as: teachers of Chemistry, supervisors in industry, technical sales personnel, and research chemists in federal, state, municipal, academic, or industrial laboratories. Students with high scholastic standing often continue with graduate work, where they may explore more thoroughly the specialized areas of chemistry in which they are interested.

The B.A. degree is useful for students who intend to pursue studies in parallel areas, such as secondary school teaching, to obtain additional majors, minors, or for pursuing professional school (such as medical, dental, or pharmacy school) outside of Chemistry. The B.S. degree is

recommended for students who wish to pursue graduate studies or a research career in Chemistry.

### Student Learning Outcomes

Upon graduation students should:

- have firm foundations in the fundamentals and application of current chemical theories.
- be able to design, carry-out, record, and analyze the results of chemical experiments.
- use modern instrumentation and classical techniques to identify and solve chemical problems as well as explore new areas of research.
- communicate the results of their work to chemists, as well as non-chemists.
- understand the ethical and environmental dimensions of problems and issues facing chemists.
- follow the proper procedures and regulations for safe storage, labeling, use of chemicals, and disposal of chemicals.
- be able to use chemical literature (perform searches for, read, evaluate, and appropriately cite publications)
- be skilled in problem solving, critical thinking, and analytical reasoning.

These skills may be applied to careers in education and industry; in professions such as law, medicine, environmental sciences, and forensic sciences. The curricula in Chemistry are approved by the American Chemical Society (ACS). Students who complete the program obtain an ACS certified baccalaureate degree provided they also take one Biochemistry course, typically BBMB 301 Survey of Biochemistry, BBMB 316 Principles of Biochemistry or BBMB 404 Biochemistry I and (<http://catalog.iastate.edu/azcourses/bbmb/>)BBMB 405 Biochemistry II.

Liberal arts majors who wish to transfer into Chemistry at the end of their second year may still complete all degree requirements and graduate within five years.

## Degree Requirements

As majors in the College of Liberal Arts and Sciences, Chemistry students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or

better in ENGL 250. The Department requires a grade of C– or better in ENGL 314.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Chemistry, B.S.

Undergraduate students seeking the Bachelor of Science (B.S.) degree in Chemistry have the following courses in their degree programs as minimum requirements.

CHEM 177 & CHEM 178 or CHEM 201 or CHEM 167	General Chemistry I and General Chemistry II Advanced General Chemistry General Chemistry for Engineering Students	4-7
CHEM 177L or CHEM 177N or CHEM 201L or CHEM 167L	Laboratory in General Chemistry I Laboratory in General Chemistry I Laboratory in Advanced General Chemistry Laboratory in General Chemistry for Engineering	1
CHEM 211	Quantitative and Environmental Analysis	2
CHEM 211L	Quantitative and Environmental Analysis Laboratory	2
CHEM 301	Inorganic Chemistry	2
CHEM 316	Instrumental Methods of Chemical Analysis	2
CHEM 316L	Instrumental Analysis Laboratory	2
CHEM 322L	Laboratory in Physical Chemistry	3
CHEM 324	Introductory Quantum Mechanics	3
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 332	Organic Chemistry II	3
CHEM 331L or CHEM 333L	Laboratory in Organic Chemistry I Laboratory in Organic Chemistry I (for Chemistry and Biochemistry Majors)	1
CHEM 332L or CHEM 334L	Laboratory in Organic Chemistry II Laboratory in Organic Chemistry II (for Chemistry and Biochemistry Majors)	1
CHEM 402	Advanced Inorganic Chemistry	3
CHEM 401L	Inorganic Chemistry Laboratory	1
Two advanced Chemistry courses (min 4 credits)		4-6
CHEM 399 Undergraduate Research or CHEM 499 Senior Research is strongly recommended. Credits earned in 399/499/490 may only be used to meet one of the advanced course requirements.		

The following are required as supporting work:

ENGL 150	Critical Thinking and Communication	3
ENGL 250 or ENGL 250H	Written, Oral, Visual, and Electronic Composition Written, Oral, Visual, and Electronic Composition: Honors	3
ENGL 314	Technical Communication	3
LIB 160	Introduction to College Level Research	1
LAS 203	Professional Career Preparation	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 265	Calculus III	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1

## Chemistry, B.A.

Undergraduate students seeking the Bachelor of Arts (B.A.) degree in Chemistry have the following courses in their degree programs as minimum requirements

One of the following sequences:		6-8
CHEM 177 & CHEM 178 or CHEM 201 or CHEM 167	General Chemistry I and General Chemistry II Advanced General Chemistry General Chemistry for Engineering Students	
CHEM 177L or CHEM 177N or CHEM 201L or CHEM 167L	Laboratory in General Chemistry I Laboratory in General Chemistry I Laboratory in Advanced General Chemistry Laboratory in General Chemistry for Engineering	1
CHEM 211	Quantitative and Environmental Analysis	2
CHEM 211L	Quantitative and Environmental Analysis Laboratory	2
CHEM 301	Inorganic Chemistry	2
CHEM 316	Instrumental Methods of Chemical Analysis	2
CHEM 316L	Instrumental Analysis Laboratory	2
CHEM 324	Introductory Quantum Mechanics	3
CHEM 321L or CHEM 322L	Laboratory in Physical Chemistry Laboratory in Physical Chemistry	2-3
CHEM 325	Chemical Thermodynamics	3
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
CHEM 332	Organic Chemistry II	3
CHEM 332L	Laboratory in Organic Chemistry II	1
The following are required as supporting work:		12



ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
ENGL 314	Technical Communication	3
LIB 160	Introduction to College Level Research	1
LAS 203	Professional Career Preparation	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
PHYS 232	Introduction to Classical Physics II	4
PHYS 232L	Introduction to Classical Physics II Laboratory	1

Teacher Preparation Focus

Chemistry majors seeking certification to teach Chemistry in secondary schools can follow the requirements of either the B.S. or the B.A. degree in Chemistry. In addition they must take the complementary coursework listed below and meet all of the requirements of the Secondary Major in Education.

Complementary Coursework

PSYCH 230	Developmental Psychology	3
EDUC 418	Secondary Science Methods I	3
EDUC 419	Secondary Science Methods II	3

- One course in Biology (BIOL 211 & 211L recommended)
- One course in American History or Government

Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

Chemistry, B.A.

Freshman

Fall	Credits Spring	Credits
CHEM 177 or 201 <sup>1,2,F</sup>	4-5 CHEM 178 or 211 <i>and</i> 211L <sup>2</sup>	3-4
CHEM 177N or 201L <sup>2,F</sup>	1 CHEM 101	1
CHEM 101 <sup>3</sup>	1 MATH 166	4
MATH 165	4 Electives	6
ENGL 150	3	
LIB 160	1	
Electives		
14-15		14-15

Sophomore

Fall	Credits Spring	Credits
CHEM 331	3 CHEM 332	3
CHEM 333L <sup>F2</sup>	2 CHEM 334L <sup>2,5</sup>	2
CHEM 110	1 ENGL 250	3
PHYS 231	4 PHYS 232 <sup>2</sup>	4
PHYS 231L	1 PHYS 232L <sup>2</sup>	1
Electives	3 CHEM 211, CHEM 211L (or Electives)	3-4
	LAS 203	1
14		17-18

Junior

Fall	Credits Spring	Credits
CHEM 324	3 CHEM 325	3
World Language - first semester of any world language accepted <sup>4</sup>	4 CHEM 321L <sup>S</sup>	2
Electives	8 CHEM 301 <sup>S</sup>	2
	World Language - second semester <sup>4</sup>	4
	CHEM 550 (strongly recommended) <sup>S</sup>	1
	Electives	3
15		15

Senior

Fall	Credits Spring	Credits
CHEM 316 <sup>F</sup>	2 BBMB 301 (strongly recommended)	3
CHEM 316L <sup>F</sup>	2 CHEM 399 (strongly recommended)	0
ENGL 314	3 Electives	12
Electives	9	
16		15

Total Credits: 120-123

- <sup>1</sup> Advanced high school chemistry and strong algebra skills are necessary for success in CHEM 201. Math ACT of 24 or greater is strongly recommended.
- <sup>2</sup> Students may substitute the following courses, if necessary:
  - CHEM 201 for 177 and 178;
  - CHEM 177L for 177N or 201L.
  - CHEM 331L and 332L for 333L and 334L; however, this substitution may result in a program which is deficient in the laboratory experience recommended by the American Chemistry Society.

- CHEM 321L for 322L; however this substitution may result in a program which is deficient in the laboratory experience recommended by the American Chemistry Society.
- PHYS 131/131L and 132/132L for PHYS 231/231L and 232/232L, however PHYS 231/231L and 232/232L are highly recommended.

<sup>3</sup> Required of Chemistry Learning Community Members.

<sup>4</sup> Completion of three years of foreign language in high school fulfills this requirement.

F Class offered Fall Semester only.

S Class offered Spring Semester only.

Individuals earning a B.A. degree in Chemistry who have taken 331L, 334L and 322L can obtain American Chemical Society certification by taking an additional advanced chemistry lecture course of BBMB 301 or 404. CHEM 550 may not be used to satisfy the Advanced Chemistry requirement.

## Chemistry, B.S.

### Freshman

Fall	Credits Spring	Credits
CHEM 177 or 201 <sup>1,2,F</sup>	4-5 CHEM 178 <sup>1,2</sup>	3
CHEM 177N or 201L <sup>2,F</sup>	1 CHEM 211	2
CHEM 101 (required for LC members)	1 CHEM 211L	2
MATH 165	4 CHEM 101	1
ENGL 150	3 MATH 166	4
LIB 160	1 Electives	3
Electives		
<b>14-15</b>		<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
CHEM 331	3 CHEM 332	3
CHEM 333L <sup>2,F</sup>	2 CHEM 334L <sup>2,S</sup>	2
CHEM 110 <sup>F</sup>	1 ENGL 250	3
MATH 265	4 PHYS 232	4
Electives	PHYS 232L	1
PHYS 231	4 CHEM 211 & CHEM 211L (or Electives)	3-4
PHYS 231L	1 LAS 203	1
<b>15</b>		<b>17-18</b>

### Junior

Fall	Credits Spring	Credits
CHEM 324	3 CHEM 325	3
CHEM 316 <sup>F</sup>	2 CHEM 322L <sup>S</sup>	3
CHEM 316L <sup>F</sup>	2 CHEM 301 <sup>S</sup>	2

World Language - first semester of any world language accepted <sup>3</sup>	4 World Language - second semester <sup>3</sup>	4
Electives	4 CHEM 550 (strongly recommended) <sup>S</sup>	1
	Electives	3
<b>15</b>		<b>16</b>

### Senior

Fall	Credits Spring	Credits
CHEM 402 <sup>F</sup>	3 CHEM 401L <sup>S</sup>	1
ENGL 314	3 Advanced Chemistry <sup>5</sup>	4-5
Electives	8 BBMB 301 (strongly recommended)	3
	CHEM 399 (strongly recommended, credits variable)	0
	Electives	6
<b>14</b>		<b>14-15</b>

### Total Credits: 120-123

<sup>1</sup> Advanced high school chemistry and strong algebra skills are necessary for success in CHEM 201. Math ACT of 24 or greater is strongly recommended.

<sup>2</sup> Students may substitute the following courses, if necessary:

- CHEM 201 for 177 and 178;
- CHEM 177I for 177N or 201L
- CHEM 331I and 332L for 333L and 334L; however, this substitution may result in a program which is deficient in the laboratory experience recommended by the American Chemistry Society.

<sup>3</sup> Completion of three years of foreign language in high school fulfills this requirement.

<sup>4</sup> The completion of two courses (minimum of 2 credits each) are required to meet this requirement. (In addition to advanced Chemistry courses, certain courses in Biochemistry-Biophysics, Chemical Engineering, Computer Science, Mathematics and Materials Science and Engineering are acceptable.) Up to four credits in undergraduate research (CHEM 339 and/or 499) can be counted as one of the two advanced chemistry courses. CHEM 550 may not be used to satisfy the Advanced Chemistry requirement.

<sup>5</sup> The program as listed above meets the standard for a certified degree of the American Chemical Society's Committee on Professional Training if BBMB 301 or 404 is one of the Advanced Chemistry Courses.

F Class offered Fall Semester only.

S Class offered Spring Semester only.

## Chemistry Minor

The Department offers a minor in chemistry which may be earned by credit in:

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
or		
CHEM 167 & 167L	General Chemistry for Engineering Students and Laboratory in General Chemistry for Engineering	5
CHEM 178	General Chemistry II	3
CHEM 211	Quantitative and Environmental Analysis	2
CHEM 211L	Quantitative and Environmental Analysis Laboratory	2
CHEM 324	Introductory Quantum Mechanics	3
CHEM 331 & CHEM 332	Organic Chemistry I and Organic Chemistry II	3-6
or CHEM 231	Elementary Organic Chemistry	
CHEM 331L & CHEM 332L	Laboratory in Organic Chemistry I and Laboratory in Organic Chemistry II	1-2
or CHEM 231L	Laboratory in Elementary Organic Chemistry	
And one of the following:		2-5
CHEM 301	Inorganic Chemistry	
CHEM 316 & 316L	Instrumental Methods of Chemical Analysis and Instrumental Analysis Laboratory	
CHEM 325 & CHEM 321L	Chemical Thermodynamics and Laboratory in Physical Chemistry	
or CHEM 322	Laboratory in Physical Chemistry	
CHEM 332 & 332L	Organic Chemistry II and Laboratory in Organic Chemistry II	

The total minimum credits in Chemistry thus will be 20 to 23 depending on which advanced courses are selected. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

The concurrent Chemistry/MBA program is designed to be completed in five academic years, with three years of undergraduate coursework followed by two years of MBA studies alongside the remaining undergraduate courses.

Concurrent students are part of the full-time MBA program. Admission to the concurrent MBA program is competitive. You should apply during your junior year. Successful candidates demonstrate superior academic ability, strong leadership attributes, and clear career focus. Previous business coursework is not a requirement for application.

Internships, co-op experiences, extracurricular, and leadership activities are highly valued in the MBA candidate selection process. However, you aren't required to have additional coursework in business in preparing for the MBA.

Admitted students typically have a cumulative GPA of 3.00 or above and have scored 600 or higher on the GMAT exam or GRE equivalent. If you're interested in the concurrent MBA program, you should apply by **March 15** of your junior year to be considered for scholarships and assistantships. The final application deadline is June 1.

## Graduate Programs

The Department offers work for the degrees Master of Science and Doctor of Philosophy with majors in Chemistry, Analytical, Inorganic, Organic, and Physical chemistry. Co-majors may be taken between areas within Chemistry or between one of the areas in Chemistry and another department. Courses in other areas of Chemistry as well as courses in other departments may be used to satisfy the requirement for coursework outside the major field. A Ph.D. student in Chemistry may choose an additional specialty in one of six areas: Materials Chemistry, Industrial Chemistry, Biomolecular Sciences, Chemistry Education, Chemical Instrumentation, and Forensic Chemistry. A minimum of ten credits is required for each additional specialty. A course which counts towards an additional specialty may also count toward the outside course requirement. A minor in Chemistry is available to students in other departments. The Department participates in the interdepartmental major in Toxicology.

The Department of Chemistry requires all graduate students majoring in Chemistry to teach as part of their training for an advanced degree. Prerequisite to major graduate work is the completion of undergraduate work in Chemistry, Mathematics, and Physics substantially equivalent to that required of undergraduate Chemistry majors at this institution.

## Classical Studies

The cross-disciplinary Classical Studies Program engages students with the civilizations of ancient Greece and Rome and their influence, both past and present, on western and world cultures. The Classical Studies minor and Interdisciplinary Studies major include an integrated curriculum of courses in the cultures, literatures, history, archaeology, and art of ancient Greece and Rome from prehistoric times to the reign of the Emperor Constantine. Students also study Elementary Latin. Current information about the Program may be found at: <http://language.iastate.edu/academic-programs/classical-studies/>

Courses in Classical Studies provide background and a classical context for students whose major fields of study or career interests include History, Anthropology, English, World Languages and Cultures,

Philosophy, Women's and Gender Studies, material culture, law, medicine, political science, the life sciences, and related fields.

Students interested in pursuing an Interdisciplinary Studies major or minor in Classical Studies should meet with an academic advisor in the Department of World Languages and Cultures (<https://language.iastate.edu/advising/>) and the Classical Studies Program director (<https://language.iastate.edu/directory/#clst>).

(Note: neither this major nor minor prepares students for graduate study in Classical Studies.)

## Student Learning Outcomes

Upon the completion of their program of study, students with an interdisciplinary studies major in Classical Studies will demonstrate proficiency in three goal areas: Knowledge and Evidence, Interdisciplinarity, and Cross-Cultural Literacy.

1. Knowledge and Evidence: acquisition and communication of knowledge about the ancient Greco-Roman world through the use, critical evaluation, and contextualization of diverse bodies of evidence.
2. Interdisciplinarity: integration of subdisciplines and other fields and their methodologies to understand the complexities and limitations of various bodies of evidence and connect texts and artifacts to their cultural contexts.
3. Cross-Cultural Literacy: meaningful and creative engagement with multiple perspectives, ability to think from the perspective of a different value system and imagine different everyday experiences and different social norms.

## Interdisciplinary Studies Major in Classical Studies (CL ST)

Students interested in pursuing an Interdisciplinary Studies major in Classical Studies should consult the Program Chair (see "Program Faculty" at <https://language.iastate.edu/classical-studies/>) or an Academic Advisor in the Department of World Languages and Cultures (<https://language.iastate.edu/advising/>).

### Required Latin Languages Courses (6 Credits)

(100-level courses cannot count toward major credit requirements.)

LATIN 101	Elementary Latin I	3
LATIN 102	Elementary Latin II	3

The major requires 36 credits and permits great flexibility while maintaining academic rigor, breadth, and focus. Many courses are cross-listed with those in other departments (see course descriptions, below).

### A. Required Foundation Course: (3 credits)

CL ST 273	Greek and Roman Mythology	3
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or CL ST 275 The Ancient City

### B. Required Ancient History Courses: (6 credits)

CL ST 402	Greek Civilization.	3
CL ST 403	Roman Civilization.	3

C. Additional Courses: Students must take at least 27 credits chosen from a, b, and c below (or approved by the Program Committee), with a minimum of 3 credits from each section (not including the course used for the Required Foundation Course).

#### a) Material Culture and Art: (at least 3 credits)

CL ST 369	Ancient Egypt	3
CL ST 376A	Classical Archeology: Bronze Age and Early Iron Age Greece	3
CL ST 376B	Classical Archeology: Archaic through Hellenistic Greece (ca 700-30 BCE)	3
CL ST 376C	Classical Archaeology: Roman Archaeology (ca 1000 BCE-400 CE)	3

CL ST 383	Greek and Roman Art	3
CL ST 384	Roman Italy: An Introduction	2
CL ST 385	Study Abroad: Roman Italy: Building the Empire	3
CL ST 394	The Archaeology of Greece: An Introduction	2
CL ST 395	Study Abroad: The Archaeology of Greece	2-6

#### b) Literature: (at least 3 credits)

CL ST 353	World Literature: Western Foundations through Renaissance	3
CL ST 372	Greek and Roman Tragedy and Comedy	3
CL ST 373	Heroes of Greece, Rome, and Today	3

#### c) Cultural Studies: (at least 3 credits)

CL ST 273	Greek and Roman Mythology	3
CL ST 275	The Ancient City	3
CL ST 310	Ancient Philosophy	3
CL ST 350	Rhetorical Traditions	3
CL ST 367	Christianity in the Roman Empire	3
CL ST 368	Religions of Ancient Greece and Rome	3
CL ST 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3
CL ST 430	Foundations of Western Political Thought	3
CL ST 480	Seminar in Classical Studies	3
CL ST 490	Independent Study	1-6
LATIN 490	Independent Study	1-6
CL ST 512A	Readings Seminar in European History: Ancient	3
CL ST 530	Foundations of Western Political Thought	3
CL ST 594A	Research Seminar in European History: Ancient	3

## Notes

1. The list of acceptable courses may include courses not currently in the list above. Contact the Classical Studies Program director for information on eligible courses.

2. The general requirements for the Interdisciplinary Studies major in the College of Liberal Arts and Sciences must be met. All courses in the major must be at the 200-level or higher. At least 15 credits must be at the 300-level or higher with at least 6 credits at the 400-level or higher. An average grade of C or better must be earned in 15 credits at the 300-level or higher in the major.

3. Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250 Written, Oral, Visual, and Electronic Composition (or ENGL 250H Written, Oral, Visual, and Electronic Composition: Honors). In addition, the Department requires a grade of C or better in any course numbered between 350 and 379 in Classical Studies.

4. LATIN 490 Independent Study (1-6 credits, repeatable up to 9 credits): This option will only occasionally be available and only to students who have successfully completed intermediate-level Latin coursework elsewhere.

As majors in the College of Liberal Arts and Sciences, Interdisciplinary Studies students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Minor in Classical Studies

The minor in Classical Studies requires 18 credits: 6 credits of Latin and 12 credits of CL ST courses taught in English. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

a) The following set of courses in Latin: (6 credits)

LATIN 101	Elementary Latin I	3
LATIN 102	Elementary Latin II	3

b) One of the following introductory courses: (3 credits) 3

CL ST 273 Greek and Roman Mythology (or)

CL ST 275 The Ancient City

c) One course in ancient history from those listed below or approved by the program committee: (3 credits) 3

CL ST 402 Greek Civilization.

CL ST 403 Roman Civilization.

d) Two additional courses (not used to meet other CL ST minor requirements) from those listed below or approved by the program committee: (6 credits) 6

One of these classes (3 crs) must be at the 300-level or above.

CL ST 273 Greek and Roman Mythology

CL ST 275 The Ancient City

CL ST 310 Ancient Philosophy

CL ST 350 Rhetorical Traditions

CL ST 353 World Literature: Western Foundations through Renaissance

CL ST 367 Christianity in the Roman Empire

CL ST 368 Religions of Ancient Greece and Rome

CL ST 369 Ancient Egypt

CL ST 372 Greek and Roman Tragedy and Comedy

CL ST 373 Heroes of Greece, Rome, and Today

CL ST 374 Sex, Gender, and Culture in the Ancient Mediterranean World

CL ST 376A Classical Archeology: Bronze Age and Early Iron Age Greece

CL ST 376B Classical Archeology: Archaic through Hellenistic Greece (ca 700-30 BCE)

CL ST 376C Classical Archaeology: Roman Archaeology (ca 1000 BCE-400 CE)

CL ST 383 Greek and Roman Art

CL ST 384 Roman Italy: An Introduction

CL ST 385 Study Abroad: Roman Italy: Building the Empire

CL ST 394 The Archaeology of Greece: An Introduction

CL ST 395 Study Abroad: The Archaeology of Greece

CL ST 402 Greek Civilization.

CL ST 403 Roman Civilization.

CL ST 430 Foundations of Western Political Thought

CL ST 480 Seminar in Classical Studies

CL ST 490 Independent Study

CL ST 512A Readings Seminar in European History: Ancient

CL ST 530 Foundations of Western Political Thought

CL ST 594A Research Seminar in European History: Ancient

LATIN 490 Independent Study

## Climate Science

Climate impacts global environmental and ecological systems, human health, water availability, agricultural systems and food security, human migrations, and economic systems. Future climate change is projected to further worsen food insecurity, water scarcity, human migrations, and global conflict.

This major is designed to give the students a solid foundation on how the climate system works and competency in areas of data analysis, planning and mitigation, and science communication. Students will take core courses in climate science and complementary areas, and select at least one focus area for additional specialization. Focus areas include: advanced climate science; data visualization; design and planning for sustainability; food, agriculture and biodiversity; policy and human behavior; and science communication.

### Student Learning Outcomes:

Graduates of the Climate Science degree will have the skills and knowledge to:

1. Understand scientific principles and their application to scientific inquiry and to societal concerns relating to climate science.
2. Demonstrate a broad understanding of the climate system, how it works on multiple timescales, and the utility of tools, such as models, and their strengths and limitations in the context of climate science.
3. Demonstrate a broad understanding of climate issues and policies.
4. Think critically about the range of climate information, data, and literature coming from a variety of sources and distill application-relevant knowledge.
5. Demonstrate proficiency in data analysis and problem-solving of relevant climate systems, issues, and challenges.
6. Understand societal concerns related to climate change to develop and/or promote practical and applied research within the climate change research community.
7. Work with diverse teams whose members have a range of professional and disciplinary skills relevant to climate issues.
8. Work to identify climate-related needs and develop strategies to address these needs.
9. Use systems thinking approaches to better understand/solve climate change issues.
10. Effectively communicate in oral, written, and visual formats.

### Climate Science Core Curriculum

C R P 293	Environmental Planning	3
or SOC 220	Globalization and Sustainability	
ECON 380	Energy, Environmental and Resource Economics	3
GEOL 100	How the Earth Works	3

or GEOL 101	Environmental Geology: Earth in Crisis	
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 324	Energy and the Environment	3
GEOL 415	Paleoclimatology	3
JL MC 347	Science Communication	3
MTEOR 140	Climate and Society	3
MTEOR 206	Introduction to Weather and Climate	3
MTEOR 360	Ocean-Atmosphere Interactions	3
MTEOR 404	Global Change	3
Capstone Choice		2
<b>Total Credits</b>		<b>33</b>

### Required Supporting Courses

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry *	5-6
or CHEM 167 & 167L	General Chemistry for Engineering Students and Laboratory in General Chemistry for Engineering	
or CHEM 201 & 201L	Advanced General Chemistry and Laboratory in Advanced General Chemistry	
ECON 101	Principles of Microeconomics	3
MATH 160	Survey of Calculus (MATH 165 required for Advanced Climate Science Pathway)	4
or MATH 165	Calculus I	
PHYS 131 & 131L	General Physics I and General Physics I Laboratory	5
or PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	
STAT 305	Engineering Statistics	3
or STAT 101	Principles of Statistics	
or STAT 104	Introduction to Statistics	
<b>Total Credits</b>		<b>20-21</b>

\* Students with previously earned credit for CHEM 177 and CHEM 177L may use it to meet this requirement.

### Pathway Requirement

Students must complete one specialized pathway. All pathways require at least 15 credits; students choosing the Advanced Climate Science Pathway will complete 20 credits. All pathways require 9 credits at the 300-level or higher. Students are encouraged to carefully review course prerequisites when planning course selections in their chosen pathways.

- Advanced Climate Science
- Data Visualization
- Design and Planning for Sustainability



- Food, Agriculture and Biodiversity
- Policy and Human Behavior
- Science Communication

### Advanced Climate Science

Advanced Climate Science requires MATH 166; PHYS 132 or PHYS 232; plus 12 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

MATH 166	Calculus II	4
PHYS 132	General Physics II	4
or PHYS 232	Introduction to Classical Physics II	
12 credits from the following:		
AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 406	World Climates	3
GEOL 402	Watershed Hydrology	3
GEOL 411	Hydrogeology	4
GEOL 452	Intro GIS for Geoscientists (or other advanced GIS course such as GEOL 488)	3
GEOL 468	Applied Geostatistics for Geoscientists	3
GEOL 474	Glacial and Quaternary Geology	3
GEOL 479	Surficial Processes	3
GEOL 483	Environmental Biogeochemistry	3
GEOL 489	Survey of Remote Sensing Technologies	3
MTEOR 227	Computational Meteorology I (or other computer programming course such as GEOL 559)	3
MTEOR 301	General Meteorology	4
MTEOR 341	Atmospheric Physics I	3
MTEOR 408X	Numerical Weather and Climate Prediction	3
MTEOR 452	Climate Modeling	3

### Data Visualization

Data Visualization requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

ARCH 439	Computational Design Theory	3
ARTIS 212	Studio Fundamentals: Digital Media	3
ARTIS 308	Computer Modeling, Rendering and Virtual Photography	3
ARTIS 408	Principles of 3D Animation	3
ARTIS 470X	Data, Code, and Form	3
ARTIS 473	Video Art	3
ARTIS 475	Interactive Art	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 449	Geodesign: Planning for Sustainable Futures	3
C R P 456	GIS Programming and Automation	3

GEOL 452	Intro GIS for Geoscientists	3
GEOL 488	Raster GIS for Geoscientists	3
L A 211	Digital Design Methods for Landscape Architecture	3
L A 454	Fundamentals of Remote Sensing and Spatial Analysis	3
L A 459	Digital Design Methods for Landscape Architecture	3
STAT 332	Visual Communication of Quantitative Information	3

### Design and Planning for Sustainability

Design and Planning for Sustainability requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

ARCH 451	Whole Building Energy Performance Modeling	3
ARCH 558	Sustainability and Green Architecture	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 291	World Cities and Globalization	3
C R P 293	Environmental Planning	3
C R P 301	Urban Analytical Methods	4
C R P 351	Intermediate Geographic Information Systems	3
C R P 383	Theory of the Planning Process	3
C R P 445	Transportation Policy and Planning	3
C R P 449	Geodesign: Planning for Sustainable Futures	3
C R P 455	Smart and Sustainable Cities	3
C R P 457	Geogames for Civic Engagement	3
C R P 460	Social Justice and Planning	3
C R P 484	Sustainable Communities	3
C R P 492	Planning Law, Administration and Implementation	3
GEOL 452	Intro GIS for Geoscientists	3
GEOL 488	Raster GIS for Geoscientists	3
L A 270	Foundations in Natural Resource Policy and History	3

### Food, Agriculture and Biodiversity

Food, Agriculture and Biodiversity requires 15 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

A ECL 231	Principles of Wildlife & Fisheries Conservation	3
A ECL 471	Introductory Conservation Biology	3
AGRON 180	Global Agriculture in a Changing World	3
AGRON 181	Introduction to Crop Science	3
AGRON 182	Introduction to Soil Science	3
AGRON 316	Crop Structure-Function Relationships	3
AGRON 317	Principles of Weed Science	3
AGRON 334	Forage Crop Management	3
AGRON 342	World Food Issues: Past and Present	3

AGRON 405	Soil-Plant-Animal-Atmosphere Physics	3
AGRON 406	World Climates	3
BIOL 204	Biodiversity	2
BIOL 211	Principles of Biology I	3
BIOL 312	Ecology	4
BIOL 355	Plants and People	3
BIOL 366	Plant Systematics	4
BIOL 370	GIS for Ecology and Environmental Science	3
or NREM 446	Integrating GPS and GIS for Natural Resource Management	
ENT 370	Insect Biology	3
or A ECL 366	Natural History of Iowa Vertebrates	
or BIOL 354	Animal Behavior	
ENT 374	Insects and Our Health	3
ENT 471	Insect Ecology	3
GLOBE 304	Socio-Economic Global Resource Systems	3
GLOBE 360	Global Health	3
HORT 342	Landscape Plant Installation, Establishment, and Management	3
HORT 475	Urban Forestry	3
NREM 301	Natural Resource Ecology and Soils	4
NREM 311	Field Ecology in Montana	4
NREM 390	Fire Ecology and Management	3
NREM 452	Ecosystem Management	3

### Policy and Human Behavior

Policy and Human Behavior requires POL S 283 plus 12 credits from the choices listed. The pathway requires 9 credits at the 300-level or higher.

POL S 283	Introduction to Environmental Politics and Policies	3
12 credits from the following:		
HIST 362	Global Environmental History	3
HIST 363	U. S. Environmental History	3
PHIL 230	Moral Theory and Practice	3
PHIL 330	Ethical Theory	3
PHIL 334	Environmental Ethics	3
POL S 335	Science, Technology, and Public Policy	3
POL S 344	Public Policy	3
POL S 443	Energy Policy	3
POL S 480	Ethics and Public Policy	3
PSYCH 318	Judgment and Decision Making	3
SOC 220	Globalization and Sustainability	3
SOC 382	Environmental Sociology	3

SOC 331	Social Class and Inequality	3
SOC 348	Global Poverty, Resources and Sustainable Development	3

### Science Communication

Science Communication requires 15 credits from the choices listed.

The pathway requires 9 credits at the 300-level or higher.

BPM I 323	Scientific Illustration Principles and Techniques	3
BPM I 326	Illustration and Illustration Software	3
BPM I 327	Illustration as Communication	3
COMST 327	Persuasion and Social Influence	3
ENGL 332	Visual Communication of Quantitative Information	3
ENGL 355	Literature and the Environment	3
ENGL 477	Seminar in Technical Communication	3
JL MC 260	Media Controversies in Science and Technology	3
JL MC 401	Mass Communication Theory	3
JL MC 474	Communication Technology and Social Change	3
JL MC 476	World Communication Systems	3
PHIL 206	Introduction to Logic and Scientific Reasoning	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
P R 323X	Strategic Communication in Agriculture and the Environment	3

As majors in the College of Liberal Arts and Sciences, Climate Science students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Climate Science 4-Year Plan

This plan is an example only; students should discuss their graduation plan with their advisor.

**Freshman**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
GEOL 112	1 GEOL 113	1
MTEOR 140	3 SOC 220	3
GEOL 100	3 CHEM 163	4
GEOL 100L	1 CHEM 163L	1
STAT 101	4 MTEOR 206	3
ENGL 150	3 Arts and Humanities choice	3
<b>15</b>		<b>15</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ECON 101	3 GEOL 324	3
MATH 160	4 ECON 380	3
ENGL 250	3 Arts and Humanities choice	3
LIB 160	1 Climate Science Pathway choice	3
PHYS 131	4 U.S. Diversity choice	3
PHYS 131L	1	
<b>16</b>		<b>15</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MTEOR 404	3 MTEOR 360	3
GEOL 415	3 JL MC 347	3
Climate Science Pathway choice (300+)	3 Climate Science Pathway choice (300+)	3
Arts and Humanities choice	3 Social Science choice	3
Elective (300+ level)	3 Elective (300+ level)	3
<b>15</b>		<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Climate Science Pathway choice (300+)	3 Climate Science Pathway choice	3
Elective (300+ level)	3 Climate Science Capstone Course	2
Arts and Humanities choice	3 Elective (300+ level)	3
Elective (300+ level)	3 Elective (300+ level)	3
World Language 101 choice/ Elective	3-4 World Language 102 choice/ Elective	3-4
<b>15-16</b>		<b>14-15</b>

**Total Credits: 120-122**

# Communication Studies

## The Communication Studies Major

comst.las.iastate.edu (<https://comst.las.iastate.edu/>)

The Communication Studies Program focuses on human communication, exploring the ways humans create and negotiate meaning.

Communication Studies majors master a focused course of inquiry into interpersonal processes as they create and sustain relationships and impact individuals, groups, and organizations. The Communication Studies curriculum builds primarily on social science traditions in developing a liberal arts education emphasizing human communication.

Students in the Communication Studies major study applied communication theory and research in interpersonal, small group, organizational, intercultural, and other contexts.

The Communication Studies (ComSt) major teaches students how to think critically, giving them the ability to examine complex communication issues, and develop and implement strategies grounded in evidence-based research. This prepares students for careers in business and industry and graduate education. Students majoring in ComSt will find their career opportunities enhanced in professions requiring applied communication expertise, e.g., human resource management, public relations, training and development, sales management, recruitment, event planning, sales, management, organizational development, business communication, law, and international and intercultural relations.

## Student Learning Outcomes

Upon graduation Communication Studies majors will...

- Develop foundational knowledge of human communication
- Apply human communication strategies in a diverse world
- Evaluate and utilize evidence-based research
- Cultivate communication competence

## University-wide Requirements

To meet the University's Communication Proficiency requirement students are required to take:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

Plus one of the following: 3

ENGL 302	Business Communication
ENGL 309	Proposal and Report Writing
ENGL 314	Technical Communication
ENGL 415	Business and Technical Editing

A grade of C or higher is required in ENGL 250 Written, Oral, Visual, and Electronic Composition (or ENGL 250H Written, Oral, Visual, and Electronic Composition, Honors).

**Total Credits** 9

Students in all majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. (COMST 310 fulfills the international perspective requirement/COMST 210 and SP CM 323 fulfill the U.S. diversity requirement). Approved courses are listed at: <http://www.registrar.iastate.edu/courses/div-ip-guide.html> (<http://www.registrar.iastate.edu/students/div-ip-guide/>). Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## LAS College Requirements

As majors in the College of Liberal Arts and Sciences, Communication Studies students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. Students must also complete the LAS world language requirement, career proficiency requirement and LAS general education requirements. In accordance with college requirements, an overall average in Communication Studies courses of C (2.0) or better is required. This means students need a 2.0 GPA in the 33 hours taken to fulfill the major requirements in Communication Studies.

## The Communication Studies Major

Communication Studies majors must earn at least 120 credits, with 45 credits at the 300-400 levels, and a minimum of 33 credits in COMST.

### Core Requirements (15 credits)

COMST 101	Introduction to Communication Studies	3
COMST 211	Interpersonal Communication	3
COMST 301	Human Communication Theory	3
COMST 303	Introduction to Communication Research Methods	3
Plus one of the following:		3
COMST 214	Professional Communication	
COMST 218	Conflict Management	
COMST 210	Communication and U.S. Diversity	
SP CM 212	Fundamentals of Public Speaking	
<b>Total Credits</b>		<b>15</b>

### Upper Division Requirements (15 credits). Select five courses from the following

COMST 310	Intercultural Communication	3
COMST 311	Relational Communication	3
COMST 313	Leadership Communication Theories	3

COMST 314	Organizational Communication	3
COMST 317	Small Group Communication	3
COMST 319	Communication Training and Development	3
COMST 325	Nonverbal Communication	3
COMST 327	Persuasion and Social Influence	3
COMST 330	Computer Mediated Communication	3
COMST 450	Special Topics in Communication Studies	3
SP CM 323	Gender and Communication	3
<b>Total Credits</b>		<b>15</b>

### Capstone Course Requirement (3 credits)

COMST 404	Research Seminar	3
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### Additional Recommended Course

STAT 101	Principles of Statistics	4
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## Communication Studies, B.A.

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 Elective	3
COMST 101	3 Social Science Choice	3
Humanities Choice	3 Humanities Choice	3
LIB 160	1 International Perspectives Course	3
Natural Science Choice	3 COMST 211	3
COMST 104	1	
	<b>14</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
World Language/Elective	3-4 World Language/Elective	3-4
ENGL 250	3 Elective	3
Humanities Choice	3 Math Choice (STAT 101 recommended)	3-4
Social Science Choice	3 COMST 303	3
COMST 210, 214, 218, or SP CM 212	3 Natural Science Choice	2-3
	LAS 203	1
	<b>15-16</b>	<b>15-18</b>

### Junior

Fall	Credits Spring	Credits
COMST 301	3 Upper Division Comm. Requirement	3
U.S. Diversity Choice	3 Upper Division Comm. Requirement	3
Natural Science Choice	3 Humanities Choice	3

Elective 300+	3 Elective - 300+	3
Social Science Choice	3 Elective - 300+	3
<b>15</b>		<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Upper Division Comm Requirement	3 COMST 404	3
Upper Division Comm Requirement	3 Upper Division Comm Requirement	3
Any Elective	4 Verbal Comm–ENGL 302, 309, or 314	3
Electives 300+	3 Elective 300+	3
Elective 300+	3 Elective 300+	3
<b>16</b>		<b>15</b>

**Total Credits: 120-124****The Communication Studies Minor (18 credits)**

The requirements for a minor in ComSt may be fulfilled by credit in:

COMST 101	Introduction to Communication Studies	3
COMST 301	Human Communication Theory	3
Select one (1) 200-Level course:		3
COMST 210	Communication and U.S. Diversity	
COMST 211	Interpersonal Communication	
COMST 214	Professional Communication	
COMST 218	Conflict Management	
Plus 3 300-level courses, (9) credits from the following:		9
COMST 310	Intercultural Communication	
COMST 311	Relational Communication	
COMST 313	Leadership Communication Theories	
COMST 314	Organizational Communication	
COMST 317	Small Group Communication	
COMST 319	Communication Training and Development	
COMST 325	Nonverbal Communication	
COMST 327	Persuasion and Social Influence	
COMST 330	Computer Mediated Communication	
COMST 450	Special Topics in Communication Studies	

Students must earn an overall average of C (2.0) or better in all courses taken for the minor.

The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

**Total Credits 18**

## Computer Science Overview

<http://www.cs.iastate.edu>

The department of Computer Science offers Bachelor of Science and Bachelor of Arts degrees in Computer Science in the College of Liberal Arts and Sciences.

The undergraduate curriculum in Computer Science leading to the Bachelor of Science degree is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>. This degree equips students with a sound knowledge of the foundations of Computer Science as well as problem-solving and system design skills necessary to create robust, efficient, reliable, scalable, and flexible software systems. The B.S. degree in Computer Science prepares students for graduate study in Computer Science and for various business, industry, and government positions including computer scientists, information technologists, and software developers.

The purpose of the Bachelor of Arts degree in Computer Science is to accommodate students who wish to pursue a major in Computer Science while taking more courses outside of the major than a Bachelor of Science degree program permits. This will include students pursuing double majors, students pursuing one or more strong minors, and students pursuing broader liberal educations. The B.A. program retains the rigor of our B.S. program while allowing students to spread the breadth of their education over other disciplines in addition to Computer Science.

The main educational objectives of the B.S. degree program in Computer Science at Iowa State University are that its graduates demonstrate expertise, engagement, and learning within two to five years after graduation.

- **Expertise:** Graduated students should have the ability to establish peer-recognized expertise in the discipline. They should have the ability to articulate this expertise by formulating and solving problems of interest, by creating or deriving value through the application of technology, and by using mathematical foundations, algorithmic principles, and computer science theory in designing, implementing and evaluating computer-based systems and processes which meet the desired needs of their employers.
- **Engagement:** Graduated students should have the ability to be engaged in the profession through the practice of computer science in industry, academia, or the public sector. They should demonstrate effective teaming and commitment to working with others by applying communications skills and professional knowledge.
- **Learning:** Graduated students should have the ability to engage in sustained learning through graduate work, professional improvement

opportunities, and self-study so that they can adapt to the role played by information processing in ever-changing areas of science, technology, and society.

## Student Learning Outcomes

Upon graduation, students should have:

1. An ability to analyze a complex computing problem, and to apply principles of computing and other relevant disciplines to identify solutions.
2. An ability to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of the program's discipline.
3. An ability to communicate effectively in a variety of professional contexts.
4. An ability to recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles.
5. An ability to function effectively as a member or leader of a team engaged in activities appropriate to the program's discipline.
6. An ability to apply computer science theory and software development fundamentals to produce computing-based solutions.

## Undergraduate Curriculum in Software Engineering

The Department of Computer Science, together with the Department of Electrical and Computer Engineering, also offer a curriculum leading to an undergraduate degree in Software Engineering. The Software Engineering curriculum offers emphasis areas in Software Engineering principles, process, and practice. Students may also take elective courses in Computer Engineering and Computer Science.

## Degree Requirements

As majors in the College of Liberal Arts and Sciences, students pursuing both the B.A. and the B.S. in Computer Science must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Degree requirements for the B.S. in Computer Science:

The B.S. departmental requirements consist of a minimum of 49 credits in Computer Science and satisfaction of written and oral requirements.

The following courses are required:

COM S 101	Orientation	R
COM S 127	Introduction to Computer Programming	3
COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
COM S 309	Software Development Practices	3
COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 321	Introduction to Computer Architecture and Machine-Level Programming	3
COM S 327	Advanced Programming Techniques	3
COM S 331	Theory of Computing	3
COM S 342	Principles of Programming Languages	3
COM S 352	Introduction to Operating Systems	3
COM S 402	Computer Science Senior Project	3

At least 15 credits, including at least 6 credits of 400-level courses, all with a grade of C- or better, from the following:

COM S 319	Construction of User Interfaces
COM S 336	Introduction to Computer Graphics
COM S 362	Object-Oriented Analysis and Design
COM S 363	Introduction to Database Management Systems
COM S 407	Applied Formal Methods
COM S 409	Software Requirements Engineering
COM S 410	Distributed Development of Software
COM S 412	Formal Methods in Software Engineering
COM S 413	Program Analysis
COM S 415	Software System Safety
COM S 417	Software Testing
COM S 418	Introduction to Computational Geometry
COM S 421	Logic for Mathematics and Computer Science
COM S 424	Introduction to High Performance Computing
COM S 425	High Performance Computing for Scientific and Engineering Applications
COM S 426	Introduction to Parallel Algorithms and Programming
COM S 430	Concurrent Programming in Practice
COM S 433	Molecular Programming of Nanoscale Devices and Processes
COM S 435	Algorithms for Large Data Sets: Theory and Practice
COM S 437	Computer Game and Media Programming
COM S 440	Principles and Practice of Compiling
COM S 441	Programming Languages



COM S 453	Privacy Preserving Algorithms and Data Security	
COM S 454	Distributed Systems	
COM S 455	Simulation: Algorithms and Implementation	
COM S 461	Principles and Internals of Database Systems	
COM S 472	Principles of Artificial Intelligence	
COM S 474	Introduction to Machine Learning	
COM S 476	Motion Planning for Robotics and Autonomous Systems	
COM S 477	Foundations of Robotics and Computer Vision	
COM S 481	Numerical Methods for Differential Equations	
COM S 487	Introduction to Network Programming and Cloud Computing	
COM S 488	Computer Networks	
CPR E 416	Software Evolution and Maintenance	
CPR E 419	Software Tools for Large Scale Data Analysis	
CPR E 430	Network Protocols and Security	
CPR E 431	Basics of Information System Security	
CPR E 458	Real Time Systems	
CPR E 489	Computer Networking and Data Communications	

**Total Credits** **49**

Com S 414 **may not** be applied towards fulfilling the 400-level electives.

Toward satisfying the requirements of the College of Liberal Arts and Sciences, the following courses should be included:

PHIL 343	Philosophy of Technology	3
SP CM 212	Fundamentals of Public Speaking	3
LAS 203	Professional Career Preparation	1
At least 17 credits of Math and Statistics		17
MATH 165	Calculus I	4
MATH 166	Calculus II	4
COM S 230	Discrete Computational Structures	3
One Statistics course from:		
STAT 305	Engineering Statistics	3
STAT 330	Probability and Statistics for Computer Science	3
STAT 341	Introduction to the Theory of Probability and Statistics I	4
STAT 347	Probability and Statistical Theory for Data Science	4
At least one Math course from:		
MATH 207	Matrices and Linear Algebra	3
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4

MATH 304	Combinatorics	3
MATH 314	Graph Theory	3
MATH 317	Theory of Linear Algebra	4

One of the following 2-course Natural Science sequences (with labs):

BIOL 211 & 211L	Principles of Biology I and Principles of Biology Laboratory I	8
& BIOL 212 & BIOL 212L	and Principles of Biology II and Principles of Biology Laboratory II	

Or

BIOL 255 & 255L & BIOL 256 & BIOL 256L	Fundamentals of Human Anatomy and Fundamentals of Human Anatomy Laboratory and Fundamentals of Human Physiology and Fundamentals of Human Physiology Laboratory	8
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Or

CHEM 177 & 177L & CHEM 178 & CHEM 178L	General Chemistry I and Laboratory in General Chemistry I and General Chemistry II and Laboratory in College Chemistry II	9
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Or

GEOL 100 & 100L & GEOL 102 & GEOL 102L	How the Earth Works and How the Earth Works: Laboratory and History of the Earth and History of the Earth: Laboratory	8
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Or

PHYS 231 & 231L & PHYS 232 & PHYS 232L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory and Introduction to Classical Physics II and Introduction to Classical Physics II Laboratory	10
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The following courses meet the communication proficiency requirement:

LIB 160	Introduction to College Level Research	1
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
One of the following		
ENGL 302	Business Communication	3
ENGL 305	Creative Writing: Nonfiction	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3

## Degree requirements for the B.A. in Computer Science:

The B.A. departmental requirements consist of a minimum of 31 credits in Computer Science and satisfaction of written and oral requirements.

The following courses are required:

## Computer Science core:

COM S 101	Orientation	R
COM S 127	Introduction to Computer Programming	3
COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
COM S 309	Software Development Practices	3
COM S 311	Introduction to the Design and Analysis of Algorithms	3

Advanced Computer Science, five 300/400-level courses chosen from 15 lists (a) and (b) below, with at least one at the 400-level and at least two chosen from list (a). COM S 414 may not be applied towards fulfilling the 400-level electives.

## (a) Software and Hardware Systems:

COM S 321	Introduction to Computer Architecture and Machine-Level Programming
COM S 327	Advanced Programming Techniques
COM S 342	Principles of Programming Languages
COM S 352	Introduction to Operating Systems
COM S 362	Object-Oriented Analysis and Design
COM S 363	Introduction to Database Management Systems
COM S 409	Software Requirements Engineering
COM S 410	Distributed Development of Software
COM S 412	Formal Methods in Software Engineering
COM S 413	Program Analysis
COM S 415	Software System Safety
COM S 417	Software Testing
COM S 440	Principles and Practice of Compiling
COM S 441	Programming Languages
COM S 454	Distributed Systems
COM S 487	Introduction to Network Programming and Cloud Computing
COM S 488	Computer Networks

## (b) Other Advanced Computer Science:

COM S 331	Theory of Computing
COM S 336	Introduction to Computer Graphics
COM S 418	Introduction to Computational Geometry
COM S 421	Logic for Mathematics and Computer Science
COM S 433	Molecular Programming of Nanoscale Devices and Processes
COM S 435	Algorithms for Large Data Sets: Theory and Practice
COM S 437	Computer Game and Media Programming
COM S 455	Simulation: Algorithms and Implementation

COM S 472	Principles of Artificial Intelligence
COM S 474	Introduction to Machine Learning
COM S 476	Motion Planning for Robotics and Autonomous Systems
COM S 477	Foundations of Robotics and Computer Vision
<b>Total Credits</b>	<b>31</b>

Toward satisfying the requirements of the College of Liberal Arts and Sciences, the following courses should be included:

## Mathematics Core (3 courses):

MATH 165	Calculus I
MATH 166	Calculus II
COM S 230	Discrete Computational Structures

## Additional Mathematics (1 course from the following):

COM S 331	Theory of Computing
MATH 207	Matrices and Linear Algebra
MATH 265	Calculus III
MATH 266	Elementary Differential Equations
MATH 267	Elementary Differential Equations and Laplace Transforms
MATH 304	Combinatorics
MATH 314	Graph Theory
MATH 317	Theory of Linear Algebra

## Statistics (1 course from the following):

STAT 305	Engineering Statistics
STAT 330	Probability and Statistics for Computer Science
STAT 341	Introduction to the Theory of Probability and Statistics I
STAT 347	Probability and Statistical Theory for Data Science

SP CM 212	Fundamentals of Public Speaking	3
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Natural Sciences: minimum 8 credits from approved College list

The following courses meet the communication proficiency requirement:

LIB 160	Introduction to College Level Research	1
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
One of the following		
ENGL 302	Business Communication	3
ENGL 305	Creative Writing: Nonfiction	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3

The following pertains to both the B.S. and the B.A. in Computer Science:

Students must earn at least a C- in Math 165, Math 166, and each Computer Science course taken to fulfill the Degree Program. The LAS College requires the major must contain at least 8 credits in courses taken at Iowa State University that are numbered 300 or above and in which the student's grade is C or higher.

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. The Department requires a C or higher in the upper-level ENGL course (302, 305, 309, 314).

To obtain a bachelor's degree from the College of Liberal Arts and Sciences, curriculum in liberal arts and sciences, a student must earn at least 45 credits at the 300 level or above taken at a four-year college. All such credits, including courses taken on a pass/not pass basis, may be used to meet this requirement.

Students must take at least 15 credits of Computer Science courses at the 300 level or higher at Iowa State University while resident here. Computer Science transfer courses need to be a minimum grade of C or higher to be considered for course substitution.

Four Year Plan  
Computer Science, B.S.

Freshman

Fall	Credits	Spring	Credits
COM S 101	4	R COM S 227	4
COM S 127	4	3 MATH 166	4
MATH 165	3	4 ENGL 250	3
ENGL 150	1	3 LIB 160	1
SOCIAL SCIENCE	3	3 ARTS & HUMANITIES	3
	13		15

Sophomore

Fall	Credits	Spring	Credits
COM S 228	3	3 COM S 321	3
COM S 230	3	3 COM S 311	3
SCIENCE SEQUENCE PART 1	3	4 COM S 300/400 ELECTIVE	3
SOCIAL SCIENCE	4	3 SCIENCE SEQUENCE PART 2	4
WORLD LANGUAGE 101/ ELECTIVE	3-4	3-4 WORLD LANGUAGE 102/ ELECTIVE	3-4
LAS 203	1		
	17-18		16-17

Junior

Fall	Credits	Spring	Credits
COM S 309	3	COM S 327	3
COM S 300/400 ELECTIVE	3	COM S 331	3
MATH ELECTIVE	3	STAT 300 ELECTIVE	3
SP CM 212	3	ENGL 300 ELECTIVE	3
ARTS & HUMANITIES	3	PHIL 343	3
	15		15

Senior

Fall	Credits	Spring	Credits
COM S 342	3	COM S 402	3
COM S 300/400 ELECTIVE	3	COM S 352	3
COM S 400 ELECTIVE	3	COM S 400 ELECTIVE	3
SOCIAL SCIENCE & USD/IP	3	ARTS & HUMANITIES & USD/IP	3
ELECTIVE	2-3	ELECTIVE	3
	14-15		15

Total Credits: 120-123

Computer Science, B.A.

Freshman

Fall	Credits	Spring	Credits
COM S 101	4	R COM S 227	4
COM S 127	4	3 MATH 166	4
MATH 165	3	4 ENGL 250	3
ENGL 150	3	Arts and Humanities	3
Social Science	1	3 LIB 160	1
	13		15

Sophomore

Fall	Credits	Spring	Credits
COM S 228	3	COM S 311	3
COM S 230	3	Arts and Humanities	3
Natural Science 1	4	Natural Science 2	4
Elective	3	Elective	3
World Languages 1	3-4	World Languages 2	3-4
LAS 203	1		
	17-18		16-17

Junior

Fall	Credits	Spring	Credits
COM S 309	3	COM S 300/400-level Elective	3
MATH Elective	3-4	English 300-level Elective	3
SP CM 212	3	Elective	3

Arts and Humanities	3 STAT 300-level Elective	3
Elective	3 Social Science	3
<b>15-16</b>		<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
COM S 300/400-level Elective	3 COM S 300/400-level Elective	3
COM S 300/400-level Elective	3 COM S 300/400-level Elective	3
Social Science and US Diversity/IP	3 Arts and Humanities and US Diversity/IP	3
Elective	3 Elective	3
Elective	2-3 Elective	3
<b>14-15</b>		<b>15</b>

**Total Credits: 120-124**

Note: The B.A. in Computer Science, like other B.A. degrees in LAS, gives students more freedom than the B.S. to design their own curricula. However, LAS degree requirements impose some rigor on this freedom. For example, the B.A. requires 24 upper-level credits in Computer Science, Mathematics, and Statistics, but LAS requires at least 45 upper-level credits, so a substantial fraction of B.A. students' extra freedom will be confined to upper-level courses.

## Undergraduate Minor in Computer Science

The Department of Computer Science offers an undergraduate minor in Computer Science. The minor requires at least 16 credits in computer science courses. COM S 414 cannot be used to fulfill minor requirements.

A minimum grade of C- is required in COM S 227 and COM S 228. A minimum grade of C is required in both COM S 311 and the three credits of 300-level Computer Science courses and above. Students must meet all prerequisites for Computer Science courses taken to fulfill the minor. At least 6 credits of the minor must be in courses numbered 300 and above and taken at ISU with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
COM S 230	Discrete Computational Structures	3
COM S 311	Introduction to the Design and Analysis of Algorithms	3
3 credits in ComS courses at the 300 level or above		3

## Certificate in Computing Applications

Students interested in the computing applications, may want to explore the Certificate in Computing Applications; it is a cross-disciplinary course of study in the Colleges of Liberal Arts and Sciences, Engineering, and Business.

## Concurrent Bachelors and Masters Degrees

The concurrent B.S./M.S. degree in Computer Science offers highly motivated and focused students the opportunity for accelerated study. Students will be allowed to double count up to 12 credits. This program will pair undergraduate students in the concurrent program with research teams of graduate students and dedicated faculty members prominent in their fields of expertise. Students that declare concurrent enrollment will be considered graduate-level students, and therefore eligible for graduate research assistantships and scholarships. Click here for application instructions (<https://www.cs.iastate.edu/concurrent-bsms-computer-science/>).

More information can be found here: <https://www.cs.iastate.edu/cs.iastate.edu/concurrent-comajor-transfer> (<https://www.cs.iastate.edu/cs.iastate.edu/concurrent-comajor-transfer/>)

## Graduate Programs

The department offers graduate programs leading to degrees of Master of Science (MS) and Doctor of Philosophy (PhD) with a major in Computer Science. The Doctor of Philosophy degree may also be earned with computer science as a co-major with some other discipline. Additionally, the department offers a minor for the students majoring in other disciplines. The department also offers a Master of Science (MS) in Artificial Intelligence. This program is for graduate-level students with strong quantitative backgrounds who are interested in learning AI and machine-learning techniques.

Established research areas include algorithms, artificial intelligence, computational complexity, computer architecture, bioinformatics, computational biology, computer networks, database systems, formal methods, information assurance, machine learning and neural networks, multimedia, operating systems, parallel and distributed computing, programming languages, robotics, and software engineering. There are also numerous opportunities for interdisciplinary research.

Typically, students beginning graduate work in the Department of Computer Science have completed a bachelor's degree or equivalent in Computer Science. However, some students with undergraduate majors in other areas, such as Mathematical, physical, or biological science or engineering become successful graduate students in Computer Science.

For the degree Master of Science, 31 - 34 semester credits is required. A thesis or a creative component demonstrating research and the ability to organize and express significant ideas in computer science is required.

The purpose of the doctoral program is to train students to do original research in Computer Science. Each student is also required to attain knowledge and proficiency commensurate with a leadership role in the field. The PhD requirements are governed by the student's program of study committee within established guidelines of the department and the graduate college. They include coursework (demonstrating breadth and depth of knowledge), a research skills requirement, a preliminary examination, and a doctoral dissertation and final oral examination. The department recommends that all graduate students majoring in Computer Science teach as part of their training for an advanced degree.

## Computing Applications Certificate

The Certificate in Computing Applications is a cross-disciplinary course of study in the Colleges of Liberal Arts and Sciences, Engineering, and Business. It is designed for undergraduates not already enrolled in majors in Computer Science, Software Engineering, or Computer Engineering who wish to enhance their degree and employment possibilities by adding expertise in computing applications. The certificate program focuses on teaching students the essential skills required to develop and use computing applications in their subject domains. This certificate program will help students to be successful in today's workplace, ensuring they have the basic knowledge of programming languages and computer systems needed to enhance their employment opportunities.

The certificate program is offered jointly among the three colleges and their respective departments housing the majors of computer science, computer engineering, software engineering, and management information systems.

The program consists of 9 credit hours selected from the core and 12 credit hours in electives.

## Enrollment in the certificate

Students should fill the form at <https://www.registrar.iastate.edu/sites/default/files/uploads/forms/Curriculum%20Change%20Form%201%2021.pdf> and bring it to Computer Science Advising Center, 1200 Communications Building.

## Requirements

- 21 required credits.
- Courses applied to the certificate may not be taken on a pass not-pass basis.
- At least 9 of the credits taken at Iowa State University must be in courses numbered 300 or above.

- A minimum of 9 credits used for the certificate may not be used to meet any other department, college, or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.
- A student may not receive both an undergraduate major and a certificate of the same name.
- For students earning an Iowa State University baccalaureate degree, a certificate is awarded concurrent with or after the Iowa State University baccalaureate degree.
- A certificate is not awarded until baccalaureate requirements are finished.
- After receiving a baccalaureate degree from any accredited institution, a student may enroll at Iowa State University to earn a certificate.
- A cumulative grade point average of at least 2.00 is required in courses taken at ISU for a certificate.
- A notation of completed certificate will be made on the transcript.

## Part I - Core 9-10 Credits

Students will complete either Sequence 1 or Sequence 2		
SEQUENCE 1		9-10 Credits
COM S 107	Windows Application Programming	3
or COM S 127	Introduction to Computer Programming	
or COM S 207	Fundamentals of Computer Programming	
COM S 106	Introduction to Web Programming	3
or COM S 113	Introduction to Spreadsheets and Databases	
COM S 252	Linux Operating System Essentials	3
or DS 201	Introduction to Data Science	
SEQUENCE 2		10 Credits
COM S 227	Object-oriented Programming	4
COM S 228	Introduction to Data Structures	3
COM S 252	Linux Operating System Essentials	3
or DS 201	Introduction to Data Science	

## Part II - Electives 12 Credits

### Designated Electives for the Certificate

Students will choose one elective course from the following list of courses and are responsible for satisfying the course pre-requisites of the elective selected.

- CPR E 230 Cyber Security Fundamentals
- BC BIO 322 Introduction to Bioinformatics and Computational Biology
- L A 211 Digital Design Methods for Landscape Architecture
- C R P 251 Fundamentals of Geographic Information Systems
- STAT 301 Intermediate Statistical Concepts and Methods
- PSYCH 301 Research Design and Methodology
- SOC 302 Research Methods for the Social Sciences
- ECON 207 Applied Economic Optimization
- Any course at 300 level or above in Computer Science (COM S), Computer Engineering (CPR E), Management Information Systems (MIS), or Software Engineering (S E)

The remaining 9 credits of electives are intended to allow students to develop further computing applications expertise especially within their major. These 9 elective credits can be advanced courses in their major, courses on the above electives list, or any other coursework approved by the Computer Science Advisor on the "request for undergraduate certificate." At least 9 of the 12 elective credits must be in courses numbered 300 or above and taken at Iowa State University.

## Criminal Justice

The Criminal Justice program in the College of Liberal Arts and Sciences offers a Bachelor of Arts degree and a minor in Criminal Justice.

Your adventure begins with your academic advisor. Please contact [cjsocadvising@iastate.edu](mailto:cjsocadvising@iastate.edu) for more information.

Students in this major will learn about the components of the juvenile and criminal justice systems, become acquainted with the issues affecting these systems, apply theoretical concepts to real-world phenomena, interface with criminal justice and social service providers, and plan an academic and/or applied career in criminal justice.

### Student Learning Outcomes

Graduates of this program will:

- Understand theories of crime, victimization, and criminal justice (i.e., theories about social bonds, learning, social control, conflict, labeling, rehabilitation, alternatives to incarceration).
- Think critically about crime, victimization, and criminal justice (i.e., be able to apply, critique, compare, and integrate knowledge in the area).
- Understand how race/ethnicity, gender, wealth, and power are related to crime, victimization, and criminal justice.
- Understand and be able to use basic social science research methods, as well as those most relevant to the study of crime, victimization, and criminal justice.
- Be familiar with career paths in the criminal justice system, and make career choices that best fit their career interests.

- Make appropriate decisions, think creatively and be able to express themselves in written and oral communication to supervisors and clients.

## Degree Requirements

### University Requirements

International Perspectives	3
US Diversity	3
<b>Total Credits</b>	<b>6</b>

### Communication Proficiency

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 150 and ENGL 250. In addition, majors must also take an advanced course in ENGL 302 or ENGL 309 or ENGL 314 with a grade of C or better.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
LIB 160	Introduction to College Level Research	1
ENGL 302	Business Communication	3
or ENGL 309	Proposal and Report Writing	
or ENGL 314	Technical Communication	

**Total Credits** 10

### World Language and career proficiency

3 years of High School

SPAN 097	Accelerated Spanish Review	0
2 semesters at the college level		8
LAS 203	Professional Career Preparation	1

**Total Credits** 9

### General Education Coursework

Students must select from a variety of LAS approved general education courses in each area listed below. A full list of approved courses can be found at <https://las.iastate.edu/students/academics/general-education/>.

Arts and Humanities	12
Math	3
Natural Sciences	8
Social Sciences	9
<b>Total Credits</b>	<b>32</b>

### Program of Study

A program of study that meets the needs and interests of the student and departmental requirements will be developed in consultation with the major advisor. Students must maintain a GPA of 2.0 or higher in their core courses.



SOC 115	Orientation to Sociology	1
or C J 120	The Criminal Justice League Learning Community Seminar	
C J 240	Introduction to the U.S. Criminal Justice System	3
C J 241	Youth and Crime	3
C J 242	Criminology	3
C J 340	Deviant and Criminal Behavior	3
C J 402	White-Collar Crime	3
or C J 403	Criminal Offenders	
or C J 406	Gender and Crime	
C J 460	Criminal and Juvenile Justice Internship	3
Select one of the following courses		3
C J 320	American Judicial Process	
C J 332	Philosophy of Law	
C J 339	Liberty and Law in America	
C J 404	Criminal Justice Policies	
PSYCH 383	Psychology and Law	
Select 5 of the following courses		15
C J 320	American Judicial Process	
C J 332	Philosophy of Law	
C J 335	Race, Ethnicity, and the US Criminal Justice System	
C J 339	Liberty and Law in America	
C J 351	Police and Society	
C J 352	Punishment, Corrections, and Society	
C J 354	Prevention of Crime and Delinquency	
C J 360	Latinas and Victimization	
C J 402	White-Collar Crime	
C J 404	Criminal Justice Policies	
C J 405	Drugs and Crime	
C J 406	Gender and Crime	
C J 410	Capital Punishment	
C J 451	Contemporary Issues in Policing	
C J 470	Ethical Issues in Criminal Justice	
C J 484	Topical Studies in Criminal and Juvenile Justice	
PSYCH 383	Psychology and Law	
<b>Total Credits</b>		<b>37</b>

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

As majors in the College of Liberal Arts and Sciences, Criminal Justice students must meet College of Liberal Arts and Sciences and University-

wide requirements for graduation in addition to those stated above for the major.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Criminal Justice, B.A.

### Freshman

Fall	Credits Spring	Credits
SOC 115 or C J 120	1 C J 121	1
C J 240	3 C J 241	3
ENGL 150	3 ENGL 250	3
LIB 160	1 Arts and Humanities Choice	3
Social Science Choice	3 Social Science Choice	3
Arts and Humanities Choice	3 Natural Science Choice	3
<b>14</b>		<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
C J 340	3 C J 242	3
World Languages/Elective	3-4 World Languages/Elective	3-4
Arts and Humanities Choice	3 Math Choice	3
Natural Science Choice	3 International Perspectives	3
Elective	3 Elective	3
LAS 203	1	
<b>16-17</b>		<b>15-16</b>

### Junior

Fall	Credits Spring	Credits
C J 402, 403, or 406	3 Criminal Justice Special Topics	3
Criminal Justice Special Topics	3 Criminal Justice Special Topics	3
ENGL 302, 309, or 314	3 Arts and Humanities Choice	3
Social Science Choice	3 Natural Science Choice	2
Elective	3 Elective	3
<b>15</b>		<b>14</b>

### Senior

Fall	Credits Spring	Credits
C J 320, 332, 339, or PSYCH 383	3 C J 460	3
Criminal Justice Special Topics	3 Criminal Justice Special Topics	3
U.S. Diversity	3 Elective	3

Elective	3 Elective	3
Elective	3 Elective	3
<b>15</b>		<b>15</b>

**Total Credits: 120-122**

Special Topics choices: C J 320/POL S 320; C J 332/PHIL 332, C J 339; C J 335, C J 351, C J 352, C J 354, C J 360, C J 402, C J 404, C J 405, C J 406, C J 410, C J 451, C J 470, C J 484\*; and PSYCH 383.

\*May take up to 9 credits of C J 484 special topics.

Note: This is an example four-year plan. Your actual semester schedules may vary.

**Criminal Justice Minor**

The Criminal Justice minor offers an opportunity for students to learn about the components of the criminal and juvenile justice systems, to become acquainted with the issues and problems affecting these systems, to apply theoretical concepts to real world problems, and to plan a career in the criminal justice field.

Students who declare a minor in Criminal Justice are required to complete 18 total credits. Students may do up to nine credits of SOC 460 but only three of those credits may be applied to the minor. Nine credits must be at the 300 or 400 level. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students must have a minimum grade point average of 2.0 in courses for the minor.

C J 240	Introduction to the U.S. Criminal Justice System	3
C J 460	Criminal and Juvenile Justice Internship	3
Four additional C J courses		12
<b>Total Credits</b>		<b>18</b>

## Data Science

### Overview

Data Science is a rapidly growing academic discipline fueled by the proliferation of rich and complex data emerging from activities in science, industry, and governments. As a result, there is strong demand for data science professionals today in Iowa as well as across the nation and globe, and this market is expected to continue to grow in the next decade. The data science programs are intended for students who wish to study the data science discipline for its own sake as well as for students studying any discipline at Iowa State University with the goal of enabling them to work in data science. The courses in the data science program are designed to provide students with the requisite background that would enable them to take jobs with significant data science components, e.g., establishing and operating data analysis pipelines. The capstone will provide an opportunity for students to apply

data science concepts to a domain problem while working in a multi-disciplinary team setting.

The Data Science major is intended for students with strong quantitative backgrounds and has the goal of educating students on the technical fundamentals of Data Science, with a focus on developing the knowledge and skills needed to transform data into insights. The major is an excellent opportunity for individuals who want to prepare themselves for the exciting Data Scientist positions that are in high demand today.

The minor in Data Science is intended for students studying any discipline at Iowa State and is designed to give students an in-depth understanding of data science as it is applied to a variety of domains.

The certificate in Data Science is intended for students studying any discipline at Iowa State and is designed to prepare them for future work with significant data science components. The capstone will provide an opportunity for students to apply data science concepts to a domain problem while working in a multi-disciplinary team setting.

**Student Learning Outcomes for Data Science Major**

After successfully completing the program, students majoring in Data Science will demonstrate

1. an understanding of and an ability to apply the following data science concepts, tools and methods to data analysis pipelines:
  - a. data acquisition
  - b. data preprocessing
  - c. exploratory data analysis
  - d. inferential and predictive thinking, modeling and analysis
  - e. computational thinking, data structures, and algorithms
2. an understanding of ethical, legal, societal, and economic concerns in the application of data science concepts
3. an ability to visualize, interpret and communicate the output of data analysis pipelines to stakeholders
4. an ability to function on multi-disciplinary teams using concepts and tools from data science

See Undergraduate Minor and Undergraduate Certificate subpages for the respective learning outcomes.

## Data Science Major

### Purpose

The Bachelor of Science degree program in Data Science is intended for students with strong quantitative backgrounds and has the goal of educating students on the technical fundamentals of data sciences, with a focus on developing the knowledge and skills needed to manage and analyze large-scale, heterogeneous data to address a wide range of problems.

## Requirements

The B.S. in Data Science consists of 120 total credit hours including: (1) 39 credit hours in the major core, three credits of which constitute a capstone course that is expected to provide experiential learning; (2) 9 credit hours in an application emphasis area to examine applications and theory of data sciences in a specific area; and (3) 23 credit hours of foundation courses. The capstone course will provide an opportunity for students to apply data science concepts to an application area while working in a multi-disciplinary team setting.

### Data Science Major Requirements

Data Science Core Courses		39
DS 110	Orientation to Data Science	R
DS 201	Introduction to Data Science	3
DS 202	Data Acquisition and Exploratory Data Analysis	3
DS 303	Concepts and Applications of Machine Learning	3
DS 401	Data Science Capstone	3
COM S 228	Introduction to Data Structures	3
COM S 230	Discrete Computational Structures	3
or CPR E 310	Theoretical Foundations of Computer Engineering	
COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
CPR E 419	Software Tools for Large Scale Data Analysis	4
STAT 301	Intermediate Statistical Concepts and Methods	4
STAT 347	Probability and Statistical Theory for Data Science	4
STAT 477	Introduction to Categorical Data Analysis	3

At least 9 credits from the following categories to fulfill the emphasis area:

At least 6 credits from courses at the 300, 400, or 500 level from the following designations:

A B E, ADVRT, AGRON, AN S, ARCH, BCBIO, COM S, C R P, CPR E, CYB E, CYBSC, DS, E E, ECON, FIN, GIS, I E, JL MC, LA, LING, MATH, MIS, MKT, POL S, S E, SOC, STAT, TSM

At least 3 credits from one of the following courses:

BCBIO 401	Bioinformatics of Sequences	
BCBIO 406	Bioinformatics of OMICS	
COM S 342	Principles of Programming Languages	
COM S 413	Program Analysis	
COM S 421	Logic for Mathematics and Computer Science	
COM S 424	Introduction to High Performance Computing	
COM S 426	Introduction to Parallel Algorithms and Programming	

COM S 435	Algorithms for Large Data Sets: Theory and Practice	
COM S 440	Principles and Practice of Compiling	
COM S 454	Distributed Systems	
COM S 461	Principles and Internals of Database Systems	
COM S 474	Introduction to Machine Learning	
CPR E 388	Embedded Systems II: Mobile Platforms	
CPR E 416	Software Evolution and Maintenance	
CPR E 425	High Performance Computing for Scientific and Engineering Applications	
CPR E 431	Basics of Information System Security	
E E 425	Machine learning: A Signal Processing Perspective	
DS 490X	Independent Study	
DS 490HX	Independent Study	
I E 312	Optimization	
I E 483	Data Mining	
I E 487	Big Data Analytics and Optimization	
MATH 373	Introduction to Scientific Computing	
MATH 407	Applied Linear Algebra	
MATH 424	Introduction to High Performance Computing	
MATH 481	Numerical Methods for Differential Equations	
STAT 471	Introduction to Experimental Design	
STAT 473	Introduction to Survey Sampling	
STAT 475	Introduction to Multivariate Data Analysis	
<b>Total Credits</b>		<b>9</b>

Toward satisfying pre-requisites and requirements of the College of Liberal Arts and Sciences, the following courses or their equivalents are also required:

COM S 127	Introduction to Computer Programming	3
COM S 227	Object-oriented Programming	4
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 265	Calculus III	4
MATH 207	Matrices and Linear Algebra	3
STAT 201	Introduction to Statistical Concepts and Methods	4
World Language 3 years in high school or 1 year in college		0 - 8
Natural Science		8
Social Science		9
Arts and Humanities		12
LAS 203	Professional Career Preparation	1

The following courses meet the communication proficiency requirement:

LIB 160	Introduction to College Level Research	1
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
One of the following:		
ENGL 302	Business Communication	3
ENGL 314	Technical Communication	3
ENGL 332	Visual Communication of Quantitative Information (cross-listed as STAT 332)	3

As majors in the College of Liberal Arts and Sciences, Data Science students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level or above taken at a four-year college. All such credits, including courses taken on a pass/not pass basis, may be used to meet this requirement.. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. The Data Science program requires a C or higher in the upper-level ENGL course (302, 314, or 332).

## Four Year Plan B.S., Data Science

### Freshman

Fall	Credits Spring	Credits
DS 110	R MATH 166	4
MATH 165	4 COM S 227	4
COM S 127	3 STAT 201	4
ENGL 150	3 ENGL 250	3
LIB 160	1	
Social Science	3	
	<b>14</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
DS 201	3 DS 202	3

MATH 265	4 MATH 207	3
COM S 228	3 COM S 230 or CPR E 310	3
STAT 301	4 Social Science/International Perspectives	3
Arts and Humanities/U.S. Diversity	3 Arts and Humanities	3
	LAS 203	1
	<b>17</b>	<b>16</b>

### Junior

Fall	Credits Spring	Credits
DS 303	3 COM S 363	3
STAT 347	4 STAT 477	3
COM S 311	3 Arts and Humanities	3
Arts and Humanities (300+ level)	3 Natural Science	4
Elective or World Language	3-4 Elective or World Language	3-4
	<b>16-17</b>	<b>16-17</b>

### Senior

Fall	Credits Spring	Credits
Application Emphasis Area	3 DS 401	3
Application Emphasis Area	3 CPR E 419	4
ENGL 302, 314, or 332	3 Application Emphasis Area	3
Natural Science	4 Social Science (300+ Level)	3
	<b>13</b>	<b>13</b>

The major elective courses will come from Data Science emphasis areas as outlined on the Undergraduate Major page. A student must take at least 9 credits of 300+ courses from a wide variety of designations. Additionally, 3 credits must be chosen from a list of elective courses with a data or analysis emphasis.

All students are required to take at least 45 hours of courses at the 300+ level or above. This may require taking additional electives.

## Data Science Minor Purpose

The minor in data science is intended for students studying any discipline at Iowa State and is designed to give students an in-depth understanding of data science as it is applied to a variety of domains. The minor in data science will prepare students with the technical and communication skills to enter the workforce as domain experts with data science skills.

## Learning Outcomes for Data Science Minor

After completing the minor in data science, students will demonstrate:

- an ability to apply data science concepts, tools and technologies to data analysis pipelines,

- an understanding of ethical, legal, societal, and economic concerns in application of data science concepts,
- an ability to visualize, interpret and communicate the output of data analysis pipelines to stakeholders, and
- an ability to function on multi-disciplinary teams using concepts and tools from data science.

## Requirements

The minor in data science requires the completion of 15 credit hours, including 9 credits from the data science core and 6 credits from approved data science electives.

At least 6 credits in courses numbered 300-level or above taken at ISU with a grade of C or higher.

At least 9 credits used for the minor cannot be used to meet any other department, college or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Courses for the minor cannot be taken on a pass/not-pass basis.

### Course Requirements for Data Science Minor

Core Courses (9 credits)

DS 201	Introduction to Data Science (Required)	3
DS 202	Data Acquisition and Exploratory Data Analysis (Required)	3
DS 301	Applied Data Modeling and Predictive Analysis (Required)	3

\* DS 301 has a prerequisite of an introductory statistics course: STAT 101, STAT 104, STAT 105, STAT 201, STAT 226, STAT 231, STAT 305, STAT 322, or STAT 330.

Electives (6 credits)

A B E 316	Applied Numerical Methods for Agricultural and Biosystems Engineering	3
ADVRT 335	Advertising Media Planning	3
ADVRT 497J	Ad Tech	3
AGRON 270	Geospatial Technologies	3
AGRON 425	Crop and Soil Modeling	3
BCBIO 322	Introduction to Bioinformatics and Computational Biology	3
COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
COM S 424	Introduction to High Performance Computing	3
COM S 435	Algorithms for Large Data Sets: Theory and Practice	3
COM S 453	Privacy Preserving Algorithms and Data Security	3

COM S 474	Introduction to Machine Learning	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 452	Geographic Data Management and Planning Analysis	3
C R P 454	Fundamentals of Remote Sensing and Spatial Analysis	3
C R P 456	GIS Programming and Automation	3
CPR E 419	Software Tools for Large Scale Data Analysis	4
CPR E 426	Introduction to Parallel Algorithms and Programming	4
DS 490X	Independent Study	
ECON 371	Introductory Econometrics	4
E E 428X	Image Analysis from Machine Learning	3
ENGL 332	Visual Communication of Quantitative Information	3
FIN 450	Analytical Methods in Finance	3
I E 312	Optimization	3
I E 483	Data Mining	3
L A 558	Web Mapping and Spatial Data Visualization	3
LING 410	Language as Data	3
MATH 304	Combinatorics	3
MATH 314	Graph Theory	3
MATH 373	Introduction to Scientific Computing	3
MATH 422X	Mathematical Principles of Data Science	3
MIS 436	Introduction to Business Analytics	3
MIS 446	Advanced Business Analytics	3
MKT 368	Marketing Analytics	3
STAT 301	Intermediate Statistical Concepts and Methods	4
STAT 330	Probability and Statistics for Computer Science	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 477	Introduction to Categorical Data Analysis	3
STAT 483	Empirical Methods for the Computational Sciences	3
STAT 486	Introduction to Statistical Computing	3
TSM 433	Precision Agriculture	3

## Data Science Certificate Purpose

The certificate in data science is intended for students studying any discipline at Iowa State and is designed to prepare them for future work with significant data science components. The data science certificate is also available to students who have already earned a Baccalaureate degree from Iowa State or elsewhere. The capstone will provide an opportunity for students to apply data science concepts to a domain problem while working in a multi-disciplinary team setting. The

certificate in data science will prepare students with the technical and communication skills to enter the workforce as domain experts with data science skills.

## Learning Outcomes for Data Science Certificate

After completing the certificate in data science, students will demonstrate:

- an ability to apply data science concepts, tools and technologies to data analysis pipelines,
- an understanding of ethical, legal, societal, and economic concerns in application of data science concepts,
- an ability to visualize, interpret and communicate the output of data analysis pipelines to stakeholders, and
- an ability to function on multi-disciplinary teams using concepts and tools from data science.

## Requirements

The certificate in data science requires the completion of 21 credit hours, including 9 credits from the data science core, 9 credits from approved data science electives, and a three-credit data science capstone experience.

At least 9 credits must be taken in courses numbered at the 300-level or above.

At least 9 credits used for the certificate cannot be used to meet any other department, college or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above.

Courses for the certificate cannot be taken on a pass/not-pass basis.

## Course Requirements for Data Science Certificate

Core Courses (9 credits)

DS 201	Introduction to Data Science (Required)	3
DS 202	Data Acquisition and Exploratory Data Analysis (Required)	3
DS 301	Applied Data Modeling and Predictive Analysis (Required)	3

\* DS 301 has a prerequisite of an introductory statistics course: STAT 101, STAT 104, STAT 105, STAT 201, STAT 226, STAT 231, STAT 305, STAT 322, or STAT 330.

Electives (9 credits)

A B E 316	Applied Numerical Methods for Agricultural and Biosystems Engineering	3
ADVRT 335	Advertising Media Planning	3
ADVRT 497J	Ad Tech	3
BCBIO 322	Introduction to Bioinformatics and Computational Biology	3

COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
COM S 424	Introduction to High Performance Computing	3
COM S 435	Algorithms for Large Data Sets: Theory and Practice	3
COM S 453	Privacy Preserving Algorithms and Data Security	3
COM S 474	Introduction to Machine Learning	3
C R P 251	Fundamentals of Geographic Information Systems	3
C R P 351	Intermediate Geographic Information Systems	3
C R P 452	Geographic Data Management and Planning Analysis	3
C R P 456	GIS Programming and Automation	3
CPR E 419	Software Tools for Large Scale Data Analysis	4
CPR E 426	Introduction to Parallel Algorithms and Programming	4
ECON 371	Introductory Econometrics	4
ENGL 332	Visual Communication of Quantitative Information	3
FIN 450	Analytical Methods in Finance	3
I E 312	Optimization	3
I E 483	Data Mining	3
LING 410	Language as Data	3
MATH 304	Combinatorics	3
MATH 314	Graph Theory	3
MATH 373	Introduction to Scientific Computing (MATH 422x::Mathematical Principals of Data Science)	3
MATH 422X	Mathematical Principals of Data Science	3
MIS 436	Introduction to Business Analytics (::Mathematical Principals of Data Science)	3
MIS 446	Advanced Business Analytics	3
MKT 368	Marketing Analytics	3
STAT 301	Intermediate Statistical Concepts and Methods	4
STAT 330	Probability and Statistics for Computer Science	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 477	Introduction to Categorical Data Analysis	3
STAT 483	Empirical Methods for the Computational Sciences	3
STAT 486	Introduction to Statistical Computing	3
Data Science capstone experience (3 credits)		
DS 401	Data Science Capstone	3



# Earth Science

## EARTH SCIENCE

The **Earth Science major** is a program leading to the bachelor of arts (B.A.) or bachelor of science (B.S.).

The B.A. emphasizes an interdisciplinary field and prepares the student primarily for a career in secondary education. The B.S. program provides a broad overview of geology and supporting sciences. This degree pathway is also suitable for students who may want to pursue a career in secondary education or continue on to graduate school. If a student chooses this option and is interested in secondary education, they should contact Dr. Cinzia Cervato for additional guidance.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate the ability to think critically;
- Exhibit a broad understanding of Earth systems and processes;
- Demonstrate scientific literacy and its application to scientific inquiry and societal concerns;
- Demonstrate proficiency in data collection, management, and analysis including understanding sources of error and/or uncertainty;
- Demonstrate competency with geoscience-specific techniques and field methods.
- Read and critically evaluate relevant literature and information;
- Use appropriate tools from chemistry, physics, biology, mathematics, and data science to solve discipline-specific problems;
- Present information effectively in written and oral forms;
- Work in a team environment in alignment with the ISU principles of community;
- Work independently;
- Attain employment in the geosciences or related fields, or pursue graduate studies.

## EARTH SCIENCE

Students can pursue either the Bachelor of Arts (B.A.) or the Bachelor of Science (B.S.) degree with a major in Earth Science. They can also prepare to teach Earth Science.

### Required courses for the B.A. include:

GEOL 100	How the Earth Works	3
or GEOL 101	Environmental Geology: Earth in Crisis	
or GEOL 201	Geology for Engineers and Environmental Scientists	
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 102	History of the Earth	3
GEOL 102L	History of the Earth: Laboratory	1

GEOL 302	Summer Field Studies	6
GEOL 315	Mineralogy and Earth Materials	3
GEOL 315L	Laboratory in Mineralogy and Earth Materials	1
GEOL 316	Optical Mineralogy	1
GEOL 356	Structural Geology and Tectonics	4
GEOL 357	Geological Mapping and Field Methods	1
GEOL 365	Igneous and Metamorphic Petrology	3
GEOL 368	Sedimentary Geology	4
MTEOR 206	Introduction to Weather and Climate	3
ASTRO 120	The Sky and the Solar System	3
ASTRO 150	Stars, Galaxies, and Cosmology	3
And 3 credits of geology electives		3
<b>Total Credits</b>		<b>43</b>

Required supporting courses for the B.A. include:

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
PHYS 132	General Physics II	4
PHYS 132L	General Physics II Laboratory	1

One of the following

MATH 151	Calculus for Business and Social Sciences	3
or MATH 160	Survey of Calculus	
or MATH 165	Calculus I	

One of the following

STAT 101	Principles of Statistics	4
or STAT 104	Introduction to Statistics	

And one course in Biology		3
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<b>Total Credits</b>		<b>29</b>
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**Communication Proficiency requirement:** According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. The department requires a grade of C or better in ENGL 309 or ENGL 314.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

One of the following:

ENGL 309	Proposal and Report Writing	3
or ENGL 314	Technical Communication	

**Total Credits** 9

### Required courses for the B.S. include:

GEOL 100	How the Earth Works	3
or GEOL 101	Environmental Geology: Earth in Crisis	
or GEOL 201	Geology for Engineers and Environmental Scientists	

GEOL 100L	How the Earth Works: Laboratory	1
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GEOL 102	History of the Earth	3
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GEOL 102L	History of the Earth: Laboratory	1
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GEOL 302	Summer Field Studies	6
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GEOL 315	Mineralogy and Earth Materials	3
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GEOL 315L	Laboratory in Mineralogy and Earth Materials	1
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GEOL 316	Optical Mineralogy	1
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GEOL 356	Structural Geology and Tectonics	4
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GEOL 357	Geological Mapping and Field Methods	1
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GEOL 365	Igneous and Metamorphic Petrology	3
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GEOL 368	Sedimentary Geology	4
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GEOL 479	Surficial Processes	3
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MTEOR 206	Introduction to Weather and Climate	3
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And 8 credits of electives in agronomy, astronomy, environmental science, or other approved areas.

**Total Credits** 45

Required supporting courses for the B.S. include:

CHEM 177	General Chemistry I	4
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CHEM 177L	Laboratory in General Chemistry I	1
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CHEM 178	General Chemistry II	3
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CHEM 178L	Laboratory in College Chemistry II	1
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MATH 165	Calculus I	4
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MATH 166	Calculus II	4
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PHYS 131	General Physics I	4
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PHYS 131L	General Physics I Laboratory	1
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PHYS 132	General Physics II	4
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PHYS 132L	General Physics II Laboratory	1
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STAT 101	Principles of Statistics	3-4
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or STAT 104	Introduction to Statistics	
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**Total Credits** 30-31

**Communication Proficiency requirement:** According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or

better in ENGL 250. The department requires a grade of C or better in the below communication courses.

ENGL 150	Critical Thinking and Communication	3
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ENGL 250	Written, Oral, Visual, and Electronic Composition	3
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or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
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ENGL 309	Proposal and Report Writing	3
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or ENGL 314	Technical Communication	
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or ENGL 302	Business Communication	
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or JL MC 347	Science Communication	
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**Total Credits** 9

### Required for B.A. and B.S.

As majors in the College of Liberal Arts and Sciences, Earth Science students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level in addition to the LAS world language and cultures and career preparation requirement (LAS 203 Professional Career Preparation). At least 8 credits in the major from 300+ courses must earn grade C or better. The average grade of all courses in the major must be 2.0 or higher.

### Teacher Preparation Focus

Earth Science majors seeking certification to teach Earth Science in secondary schools can follow the requirements of either the B.A. or the B.S. degree in Earth Science. In addition they must take the complementary coursework listed below and meet all of the requirements of the Secondary Major in Education. Some of these courses, and some of the required coursework for the Secondary Major in Education, may also apply to LAS general education requirements.

#### Complementary Coursework

PSYCH 230	Developmental Psychology	3
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EDUC 418	Secondary Science Methods I	3
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EDUC 419	Secondary Science Methods II	3
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One course in American History or Government

**Notes:** Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in

this catalog, but advisers and faculty will be aware. Some students pursuing the Earth Science decide to complete the Earth Science major and continue their studies as graduate students in Iowa State's Science Education, Masters of Teaching (M.A.T.) program (<https://education.iastate.edu/graduate-students/graduate-programs/division-of-teaching-learning-leadership-and-policy/educator-prep-programs-for-licensure-recommendation/science-education-m-a-t/endorsements/>).

## Earth Science, B.A.

NOTE: Course plan, sequence and credit amounts will vary depending upon which endorsement area(s) a student chooses to pursue. In addition, this plan is solely an example of one possible academic layout. This plan can and likely will be modified based on transfer credit, advanced placement (AP) credit, dual enrollment credit, "test out" credit, course offerings, schedule conflicts and entry term. *It is our expectation that students know the requirements of their academic program and develop and follow an academic plan based on their academic catalog and degree audit using their individual academic advisor as a resource in this process.*

Potential pathway for the B.A. major in Earth Science with the Secondary Major in Education:

### Freshman

Fall	Credits	Spring	Credits	Summer	Credits
ENGL 150		3 EDUC 204		3 PSYCH 230 (social science)	3
LIB 160		1 GEOL 102		3 Social Science Option <sup>1</sup>	3
GEOL 100		3 GEOL 102L		1	
GEOL 100L		1 GEOL 113		1	
CHEM 177		4 CHEM 178		3	
CHEM 177L		1 CHEM 178L		1	
MATH 151, 160, or 165		3-4 ASTRO 120		3	
GEOL 112		1 MTEOR 206		3	
17-18			18		6

### Sophomore

Fall	Credits	Spring	Credits	Summer	Credits
ENGL 250		3 GEOL 365		3 Humanities Option <sup>1</sup>	3
PHYS 131		4 PHYS 132		4	
PHYS 131L		1 PHYS 132L		1	
GEOL 315		3 EDUC 333 (social science)		3	

GEOL 315L	1 Humanities Option <sup>1</sup>	3
GEOL 316	1 ASTRO 150	3
LAS 203	1	
EDUC 202	3	
EDUC 280L	0.5	
EDUC 219	1	
Apply/ Accepted to Educator Preparation Program		

18.5			17			3
Junior						
Fall	Credits	Spring	Credits	Summer	Credits	
EDUC 347		3 ENGL 302, 309, 314, or JL MC 347		3 GEOL 302		6
EDUC 418		3 EDUC 419		3		
EDUC 280A		1-2 EDUC 480J		2		
GEOL 357		1 COMST 211, SP CM 212, or THTRE 358		3		
GEOL 368		4 STAT 101 or 104		3-4		
HIST 280 or 281 (humanities)		3 GEOL 356		4		
15-16			18-19			6

### Senior

Fall	Credits	Spring	Credits
Geology Option <sup>1</sup>		3 EDUC 417J	16
Humanities Option <sup>1</sup>		3 PPAT	
SP ED 401	3		
EDUC 406	3		
Social Science Option <sup>1</sup>	3		
Biology Option <sup>1</sup>	3		

Apply to  
student  
teach  
Apply for  
graduation

18

16

Students must take an American History (counts as humanities) or  
American Government (counts as social science).

<sup>1</sup> Choose from list of approved courses available from an advisor.

## EARTH SCIENCE, B.S.

Potential pathway for the B.S. in Earth Science degree:

### Freshman

Fall	Credits	Spring	Credits
ENGL 150		3 GEOL 102	3
GEOL 100 or 101		3 GEOL 102L	1
GEOL 100L		1 CHEM 178	3
CHEM 177		4 CHEM 178L	1
CHEM 177L		1 MATH 166	4
MATH 165		4 Arts-and- Humanities Choice	3
LIB 160		1	
17		15	

### Sophomore

Fall	Credits	Spring	Credits
ENGL 250		3 GEOL 365	3
GEOL 315		3 Arts-and- Humanities Choice	3
GEOL 315L		1 PHYS 132	4
GEOL 316		1 PHYS 132L	1
PHYS 131		4 STAT 101 or 104	3-4
PHYS 131L		1 MTEOR 206	3
LAS 203		1	
14		17-18	

### Junior

Fall	Credits	Spring	Credits	Summer	Credits
GEOL 479		3 GEOL 356		4 GEOL 302	6
GEOL 368		4 World Language		3-4	

Agron/ Astronomy/ EnSci Choice <sup>1</sup>	3 Agron/ Astronomy/ EnSci Choice <sup>1</sup>	3
World Language	3-4 Social- Science Choice	3
GEOL 357	1	

14-15

13-14

6

### Senior

Fall	Credits	Spring	Credits
Agron/ Astronomy/ EnSci Choice <sup>1</sup>		2 Electives	9
Arts-and- Humanities Choice		3 Arts-and- Humanities Choice	3
Social Science Choice		3 Social- Science Choice	3
ENGL 309, 302, 314, or JL MC 347		3	
Elective		3-4	
14-15		15	

<sup>1</sup> Choose from list of approved courses available from an advisor or  
departmental office.

## Graduate Programs

The department offers programs leading to the master of science and doctor of philosophy with majors in Geology, Earth Science, and Meteorology. Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and mathematical sciences. Individuals desiring to enter a graduate program are evaluated by considering their undergraduate preparation and performance along with their expressed goals in the statement of purpose. All prospective students should reach out to individual faculty members who they wish to work with prior to applying.

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major. Additional coursework is normally taken in complementary areas such as aerospace engineering, agronomy (soil science), chemistry, civil and construction engineering, computer engineering, computer science, engineering mechanics, environmental

science, materials engineering, mathematics, mechanical engineering, microbiology, physics, or statistics. Departmental requirements provide a strong, broad background in the major and allow considerable flexibility in the program of each individual.

A dissertation is required of all Ph.D. candidates.

M.S. students in Geology are required to complete a thesis. The M.S. in Earth Science is available to students electing the non-thesis (Creative Component) option in Geology or Meteorology.

Graduates in Geology specialize in a sub-discipline, but they comprehend and can communicate the basic principles of geology and supporting sciences. They possess the capacity for critical and independent thinking. They are able to write a fundable research proposal, evaluate current relevant literature, carry out the proposed research, and communicate the results of their research to peers at national meetings and to the general public. They work as consultants on engineering and environmental problems, explorers for new minerals and hydrocarbon resources, researchers, teachers, writers, editors, and museum curators.

## Ecology, Evolution, and Organismal Biology Overview

Within the Biological Sciences, studies of ecology, evolution, and organismal biology are essential in understanding the complex relationships of life on Planet Earth. Ecology focuses on the interactions among organisms as well as the interactions between organisms and their physical environments. Evolutionary theory addresses the origins and interrelationships of species. Organismal biology studies both the diversity of biological organisms and the structure and function of individual organisms.

## Undergraduate Study

The Department of Ecology, Evolution, and Organismal Biology (<https://www.eeob.iastate.edu/>) (EEOB) offers several undergraduate majors with other departments. Students interested in the areas of ecology, evolution, and organismal biology should major in Biology, Environmental Science, or Genetics. The Biology Major is administered and offered jointly by the EEOB (<https://www.eeob.iastate.edu/>) and GDCB (<https://www.gdcb.iastate.edu/>) departments. The faculty of EEOB, together with those in GDCB and BBMB (<https://www.bbmb.iastate.edu/>), administer and offer the Genetics Major. Faculty in EEOB, in cooperation with faculty from other departments on campus, administer and offer the Environmental Science Major. Each of these majors are available through the College of Liberal Arts and Sciences or through the College of Agriculture and Life Sciences. Faculty in the EEOB Department also

teach undergraduate courses at Iowa Lakeside Laboratory (see the Iowa Lakeside Laboratory listing).

## Graduate Study

The department offers graduate work leading to both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. EEOB graduate students major in one of several interdepartmental majors including Bioinformatics and Computational Biology, Ecology and Evolutionary Biology, Environmental Science, Genetics, Interdisciplinary Graduate Studies, Neuroscience, and Toxicology. The EEOB faculty members are active in the interdepartmental graduate majors and teach a wide range of graduate courses. Faculty research programs cover a wide range of specializations including physiology and physiological ecology; microbiology; animal behavior; evolutionary genetics of plants and animals; modeling of evolutionary and ecological processes; plant and animal systematics; neurobiology; developmental biology; aquatic and wetland ecology; functional, population, community, landscape, and ecosystem ecology; and conservation biology. For further information on faculty research interests check the EEOB web site (<http://www.eeob.iastate.edu/>). Some EEOB faculty teach graduate courses at Iowa Lakeside Laboratory. Field Station courses are also available through the Gulf Coast Marine Laboratory and the Organization for Tropical Studies (see the Biology listing).

Students who are enrolled in the interdepartmental graduate majors with EEOB affiliation are required to participate in departmental seminars, to participate in research activities, and to show adequate progress and professional development while pursuing their degree. For both the M.S. and Ph.D. degrees, it is expected that research conducted by the student will culminate in the writing and presentation of a thesis or dissertation. Requirements and guidelines for study are provided by the Graduate College, the EEOB faculty, and the individual student's major professor and Program of Study Committee. General information about graduate study requirements can be found at the web site for the Graduate College and requirements for the interdepartmental majors can be found by following the links from the EEOB web site above. Although not a formal requirement, the EEOB faculty recommends that students pursuing the Ph.D. include teaching experience in their graduate training.

## Economics Overview

[www.econ.iastate.edu](http://www.econ.iastate.edu) (<http://www.econ.iastate.edu>)

Economics teaches the ability to reason clearly and to address complex issues using tools and decision-making models from economics, mathematics, and statistics, as well as concepts from the biological, physical, and social sciences. The study of economics also helps students to: develop an understanding of the interactions of technology, human activity, and the environment; apply systematic approaches

to making optimal choices; analyze quantitative information; and communicate concepts and findings to industry professionals, organizations, governments, and the general public.

Strong training in economic reasoning serves as a foundation for a variety of rewarding careers and for advanced study in a range of professional and academic fields. Economics majors are provided the tools of critical analysis and human relations skills that are essential for being informed citizens, finding and excelling in many career fields, and becoming lifelong learners.

In addition to the Economics major, the Department of Economics offers degrees in Business Economics and Agricultural Business.

## Student Learning Outcomes

Graduates from the Department of Economics at Iowa State University are expected to be able to:

1. Understand and apply concepts of scarcity, marginal analysis, opportunity cost and comparative advantage.
2. Critically analyze the efficiency and equity implications of market and non-market processes of allocation.
3. Evaluate policies, regulations, and business strategies using economic models and theories.
4. Use quantitative and qualitative information to evaluate economic questions.
5. Understand the determinants of differences in economic performance over time and across space.

## Degree Requirements

### Economics Major, College of Liberal Arts and Sciences

The Economics major in the College of Liberal Arts and Sciences prepares students for advanced studies in Economics, Finance, and Analytics, for professional degrees such as medicine, law and business administration (MBA), and for careers in finance, business and economic research, management, insurance, brokerage, real estate, labor relations, international development, and government service. Candidates for the Bachelor of Science degree with a major in Economics must fulfill requirements established by the College of Liberal Arts and Sciences. For details of undergraduate curricula in liberal arts and sciences, see College of Liberal Arts and Sciences. A double major in Economics and Agricultural Business is permitted. A double major in Economics and Business Economics is not permitted. A major in Business Economics with a minor in Economics is not permitted. A minor in Economics cannot be combined with a major in Agricultural Business, and minors in both Agricultural Business and Economics are not permitted.

Students majoring in Economics are required to take the following courses within the General Education Area of Mathematics:

Choose one of the following pairs:

7-8

MATH 160 & ECON 207	Survey of Calculus and Applied Economic Optimization
MATH 165 & ECON 207	Calculus I and Applied Economic Optimization *
MATH 165 & MATH 166	Calculus I and Calculus II

Choose one of the following pairs:

6

STAT 226 & STAT 326	Introduction to Business Statistics I and Introduction to Business Statistics II
STAT 341 & STAT 342	Introduction to the Theory of Probability and Statistics I and Introduction to the Theory of Probability and Statistics II

Students planning to attend graduate programs in Economics or related fields are encouraged to take MATH 165 Calculus I, MATH 166 Calculus II, STAT 341 Introduction to the Theory of Probability and Statistics I, and STAT 342 Introduction to the Theory of Probability and Statistics II.

Students planning for careers in the finance industry or government sectors are encouraged to enroll in STAT 226 Introduction to Business Statistics I and STAT 326 Introduction to Business Statistics II.

Students must complete the following courses in economics:

ECON 101	Principles of Microeconomics	3
ECON 102	Principles of Macroeconomics	3
ECON 301	Intermediate Microeconomics	3-4
ECON 302	Intermediate Macroeconomics	3
ECON 371	Introductory Econometrics	4
Three credits of ECON 230-239, 300-389, 400-489 courses.		3
Nine credits of 400-489 level ECON courses.		9
ECON 492	Graduating Senior Survey	R

A minimum of 18 credits of economics coursework must be earned at Iowa State University. Economics majors must earn a minimum GPA of 2.0 across ECON 101 Principles of Microeconomics, ECON 102 Principles of Macroeconomics, ECON 301 Intermediate Microeconomics, and ECON 302 Intermediate Macroeconomics, with no grade in these lower than a C-.

Communication Proficiency Requirement: According to the University-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or



better in ENGL 250. In addition the Economics major requires a grade of C or better in ENGL 302 or ENGL 314.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
ENGL 302	Business Communication	3
or ENGL 314	Technical Communication	

Students in all ISU majors must complete a three-credit course in both U.S. Diversity and in International Perspectives. The two courses may simultaneously meet the following graduation requirements: Social Science, Arts/Humanities, ECON 400-489, or Econ courses from approved list. Please discuss with your advisor.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. Three of the required 45 credits at the 300+ level must be earned in a general education group outside the group of your major. Economics majors must meet or complete the LAS world language requirement and career proficiency requirement.

As majors in the College of Liberal Arts and Sciences, Economics students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

## Four Year Plan Bachelor of Science in Economics

### Freshman

Fall	Credits Spring	Credits
ECON 101	3 ECON 102	3
ENGL 150	3 ECON 207 <sup>a</sup>	3
LIB 160	1 Arts and Humanities	3
MATH 160 <sup>a</sup>	4 Natural Science	3
Arts and Humanities	3 Social Science	3
	<b>14</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
ECON 301	4 ECON 302	3
ENGL 250	3 STAT 326 <sup>b</sup>	3
STAT 226 <sup>b</sup>	3 Elective or World Language	4
LAS 203	1 Social Science	3
Elective or World Language	4 Natural Science	3
	<b>15</b>	<b>16</b>

### Junior

Fall	Credits Spring	Credits
ECON 371	4 ECON 400-489	3
ECON 230-239, 300-389, or 400-489	3 Electives	9
Arts and Humanities	3 International or Diversity	3
Elective	2	
International or Diversity	3	
	<b>15</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
ECON 400-489	3 ECON 400-489	3
ENGL 302 or 314	3 ECON 492	R
Arts and Humanities	3 Natural Science	2
Electives	6 Electives	10
	<b>15</b>	<b>15</b>

### Total Credits: 120

Students in all ISU majors must complete a three-credit course in both U.S. Diversity and in International Perspectives. The two courses may simultaneously meet the following graduation requirements: Social Science, Arts/Humanities, ECON 400-489, or Econ courses from approved list. Please discuss with our advisor.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. Three of the required 45 credits at the 300+ level must be earned in a general education group outside the group of your major. Econ majors must meet or complete the LAS world language requirement. In addition, Econ majors must earn a minimum of 18 credits from courses taught by the Department of Economics at ISU.

a MATH 165 (Calculus I) and MATH 166 (Calculus II) may be substituted for MATH 160 and ECON 207.

b STAT 341 (Introduction to Theory of Probability & Stats I) and STAT 342 (Introduction to Theory of Probability & Stats II) may be substituted for STAT 226 and 326.

## Minor

### Economics Minor, College of Liberal Arts and Sciences

For a minor in Economics, students complete a minimum of 15 credits.

The minor must include at least 9 credits that are not used to meet any other Department, College, or University requirement.

ECON 101	Principles of Microeconomics	3
ECON 102	Principles of Macroeconomics	3
ECON 301	Intermediate Microeconomics *	3-4
Three credits of ECON 230-239, 300-389, 400-489 courses.		3

Three credits of ECON 300-389, 400-489 courses.

3

#### Total Credits

15-16

\* Pre-reqs for ECON 301 include MATH 166 Calculus II or ECON 207 Applied Economic Optimization.

The Department of Economics has concurrent Bachelor of Science/ Master of Science (BS/MS) programs designed especially for seniors who wish to pursue advanced studies. Concurrent BS/MS programs are: economics (BS) with economics (MS) or agricultural economics (MS). The concurrent BS/MS program allows seniors to complete an MS degree within 12 months of BS completion.

For more information about our concurrent undergraduate and graduate programs in Economics, visit: <https://www.econ.iastate.edu/iowa-state-ms-econ-programs> (<https://www.econ.iastate.edu/iowa-state-ms-econ-programs/>)

## Graduate Programs

### Graduate Programs in Economics and Agricultural Economics

The Department of Economics offers work toward the degrees Master of Science and Doctor of Philosophy with majors in Economics and Agricultural Economics. The Department also offers minors to students with majors in other departments. For more information, visit our web site at [www.econ.iastate.edu](http://www.econ.iastate.edu) (<http://www.econ.iastate.edu>).

Students do not need to have an undergraduate major in Economics or Agricultural Economics to qualify for graduate work in the Department. However, students must have completed undergraduate coursework in macroeconomics, microeconomics, statistics, calculus, and matrix algebra. Some background in math courses emphasizing logic and proofs is preferred, particularly for the Ph.D.

Candidates for the degree Master of Science (thesis option) are required to complete satisfactorily 30 credits of acceptable graduate work, including preparation of a thesis.

Candidates for the degree Master of Science (non-thesis option) may fulfill requirements by satisfactorily completing 32 credits of acceptable graduate work, including preparation of a creative component.

Programs of study for the doctorate are organized by each student in consultation with the major professor and the student's committee. Subject to staffing constraints, the Department offers coursework to support the following fields of concentration: agricultural economics, applied econometrics, environmental and resource economics, financial economics, human resources, industrial organization, international economics, and macroeconomics. Students must complete advanced courses in microeconomic and macroeconomic theory, quantitative

methods and econometrics, and two fields from the list above. Students are required to participate in workshops and demonstrate competence in theory by passing qualifying examinations.

## English UNDERGRADUATE STUDY

Students in the undergraduate majors offered through the English department (<https://engl.iastate.edu/>) develop critical thinking, cultural awareness, effective communication, imagination, leadership, pedagogy, and agency as citizens.

In a communication-rich and globally connected world, these skills play a crucial role in every profession. Studying in English expands and deepens individual engagement in the social, cultural, artistic, scientific, technical, and environmental work of society.

Students interested in majoring in English can choose from this range of options:

- **BA in English** (designed so that majors experience the broad, diverse scope of English studies and create a course plan to match their personal interests and professional goals)
- **BA with a Secondary Major in Education** (for students seeking licensure in secondary education with an opportunity to earn an ESL endorsement as well)
- **BS in English** (by fulfilling BA in English requirements and taking 12 additional credits in natural science, social science, or mathematics)

The English major offers a flexible degree that allows students to gain experience in fields such as literature, rhetoric, creative writing, English education, film, literary editing, and professional communication.

Please visit the Department of English website (<https://engl.iastate.edu/>) to learn more about the opportunities available to English majors as well as the other specialized undergraduate majors offered by the department. The diverse majors within English prepare students for careers that span law, medicine, theology, business, education, advocacy, event planning, management, marketing, publishing, nonprofit and government communication, public service, sales, and speech writing, library science, web design and communication consulting, editing, software documentation, usability and user experience, as well as scientific, technical, and environmental writing.

Adding a major or minor in English to your field of study at Iowa State increases your communication, analytical, and critical thinking skills and will play a key role in your life as a student and in your life after graduation.

## BA/BS in English Learning Outcomes

Students who major in English (with a BA or BS) will be able to

- analyze how texts and media reflect, shape, or challenge diverse intellectual, political, and/or cultural concerns in their eras and our own.
- understand, apply, analyze, synthesize, and evaluate content knowledge. Competencies include discipline-specific terms, history of the field, theories in the field, elements of criticism, and cultural knowledge.
- engage in critical thinking and effective communication by analyzing and interpreting information and ideas, conducting research, and making connections between and among divergent views.
- plan, prepare, present, and evaluate written, oral, visual, and electronic communication. These competencies include scholarly skills and tools; communication that is analytical, persuasive, and/or expressive; and peer and self-editing.

Students who choose the English Education Emphasis will additionally be prepared to

- understand how learners grow and develop, valuing individual differences and cultural diversity to ensure inclusive learning environments.
- apply the content area’s central concepts and structures by using a variety of instructional strategies, including technology, to encourage student creativity, problem solving, and collaboration.
- use multiple methods of assessment to engage learners in their own growth, monitor learner progress, and guide the teacher’s and learner’s decision making.
- create instructional plans that support students in meeting rigorous learning goals by drawing upon the content area knowledge, curriculum, cross-disciplinary skills, and pedagogy.
- evaluate one’s pedagogy for the effects of choices and actions on others (learners, families, other professionals, and the community).

## BA and BS in English Requirements

The English major offers a flexible degree that allows students to gain experience in fields such as literature, rhetoric, creative writing, English education, film, literary editing, and professional communication. The Undergraduate Program of Study is designed so that majors can experience the broad, diverse scope of English studies and configure a course plan to match their personal interests and professional goals. Suggested degree plans for several customizations are available and students may choose and combine courses in any way that meets the requirements for the degree.

Students interested in the BA degree in English need to complete 36 credits, based on the table below. Students interested in the BS degree in

English need to complete the BA requirements, plus 12 additional credits in linguistics, natural science, mathematics, social science, or selected courses in kinesiology. Students seeking to complete the English Major and be recommended for teacher licensure need to complete specified coursework in English and meet the requirements of the Secondary Major in Education.

To graduate with a major in the English department and meet the university-wide Communication Proficiency Grade Requirement, a student must have

- earned credit for, or received a grade of at least a C in ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition
- completed and earned at least a C in one of the department’s advanced communication courses
- earned at least a C or higher in each of the ENGL courses applied to the ENGL major

As majors in the College of Liberal Arts and Sciences, English students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major. LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language and career proficiency (LAS 203) requirements. Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

The first table below lays out the requirements and options of the English major. The second table shares the specific requirements for English majors seeking licensure in English education. The English major requires a minimum of 15 credits of major requirements earned at the 300 level and a total of 9 credits of major requirements earned at the 400 level. English majors transferring from other institutions must earn at least 18 of their credits in English from Iowa State.

### English Major

Texts and Language: Choose 5		15
ENGL 201	Introduction to Literature *	
ENGL 207	Introduction to Creative Writing	
ENGL 214	Introduction to Technical Communication	
ENGL 220	Descriptive English Grammar	
ENGL 225	Survey of British Literature to 1800 *	
ENGL 226	Survey of British Literature since 1800 *	
ENGL 227	Survey of American Literature to 1865 *	
ENGL 228	Survey of American Literature since 1865 *	

ENGL 237	Survey of Film History *	
ENGL 260	Introduction to Literary Study *	
ENGL 353	World Literature: Western Foundations through Renaissance *	
ENGL 354	World Literature: Seventeenth Century to the Present *	
Advanced Communication: Choose 1		3
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 304	Creative Writing: Fiction	
ENGL 305	Creative Writing: Nonfiction	
ENGL 306	Creative Writing: Poetry	
ENGL 308	Write Like a Woman	
ENGL 309	Proposal and Report Writing	
ENGL 313	Rhetorical Website Design	
ENGL 314	Technical Communication	
ENGL 315	Creative Writing: Screenplays	
ENGL 316	Creative Writing: Playwriting	
Critical Reading and Textual Analysis: Choose 2		6
ENGL 275	Analysis of Popular Culture Texts	
ENGL 310	Rhetorical Analysis	
ENGL 339	Literary Theory and Criticism	
ENGL 350	Rhetorical Traditions *	
ENGL 396	Teaching the Reading of Young Adult Literature	
ENGL 418	Seminar in Argumentation	
Literature of Social and Environmental Justice: Choose 1		
ENGL 240	Introduction to American Indian Literature	
ENGL 345	Women and Literature: Selected Topics *	
ENGL 346	American Indian Literature *	
ENGL 347	Studies in African American Literature *	
ENGL 349	Topics in Multicultural Literatures of the United States *	
ENGL 352	Queer Literature *	
ENGL 355	Literature and the Environment *	
ENGL 389	Postcolonial Literature	
Historical Perspective Requirement. A minimum of 9 credits of coursework in Historical Perspective is required. This Requirement may overlap with the above requirements. Courses listed above with an * next to them or any of the courses in the following list can apply to this requirement.		
ENGL 360	Studies in American Literature to 1800	
ENGL 362	Studies in 19th Century American Literature	
ENGL 364	Studies in American Literature: 1900 to the Present	

ENGL 370	Shakespeare
ENGL 373	Studies in British Literature: The Middle Ages
ENGL 375	Studies in British Literature: The Restoration and 18th Century
ENGL 376	Studies in British Literature
ENGL 376A	Studies in British Literature: Romantic
ENGL 376B	Studies in British Literature: Victorian
ENGL 393	The History of Children's Literature
ENGL 395A	Study and Travel: Literature
ENGL 420	History of the English Language

Minimum of 12 additional English Electives at the 200, 300, and 400 level (does not include ENGL 250). A total of 15 credits of major requirements must be at the 300 level. A total of nine credits of major requirements must be at the 400 level.

**Total Credits** **36**

### English Major with Teacher Preparation Focus

All students preparing to become teachers need to complete the requirements of the major as laid out below and also complete the requirements of the Secondary Major in Education, including completion of Student Teaching (ENGL 417E Student Teaching: English and Literature). Credits in ENGL 417E can apply toward the 400 level courses requirement of the English major. Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

Texts and Language:		15
ENGL 225	Survey of British Literature to 1800	
ENGL 226	Survey of British Literature since 1800	
ENGL 227	Survey of American Literature to 1865	
ENGL 228	Survey of American Literature since 1865	
ENGL 260	Introduction to Literary Study	
Advanced Communication: Choose 1		3
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 304	Creative Writing: Fiction	
ENGL 305	Creative Writing: Nonfiction	
ENGL 306	Creative Writing: Poetry	
ENGL 309	Proposal and Report Writing	
ENGL 313	Rhetorical Website Design	
ENGL 314	Technical Communication	
ENGL 315	Creative Writing: Screenplays	
ENGL 316	Creative Writing: Playwriting	
Critical Reading and Textual Analysis:		9

ENGL 310	Rhetorical Analysis	
or ENGL 339 Literary Theory and Criticism		
ENGL 353	World Literature: Western Foundations through Renaissance	
ENGL 354	World Literature: Seventeenth Century to the Present	
Literature of Social and Environmental Justice: Choose 1		3
ENGL 345	Women and Literature: Selected Topics	
ENGL 346	American Indian Literature	
ENGL 347	Studies in African American Literature	
ENGL 349	Topics in Multicultural Literatures of the United States	
ENGL 389	Postcolonial Literature	
Language and Methods for Teachers		21
ENGL 219	Introduction to Linguistics	
ENGL 220	Descriptive English Grammar	
ENGL 396	Teaching the Reading of Young Adult Literature	
ENGL 397	Practice and Theory of Teaching Writing in the Secondary Schools	
ENGL 420	History of the English Language	
EDUC 426	Principles of Secondary Education	
ENGL 494	Practice and Theory of Teaching Literature in the Secondary Schools	
Total Credits		51

Complementary Coursework for Teacher Preparation

These courses, expected as part of the Teacher Preparation program, may also apply to college general education requirements. Some of the required coursework for the Secondary Major in Education may also apply.

Complementary Coursework		9
PSYCH 230	Developmental Psychology	
SP CM 212	Fundamentals of Public Speaking	
or THTRE 350 Oral Interpretation		
And one course in American History or Government		

ESL Endorsement Requirements

At Iowa State University, ESL is an add-on endorsement, which means that students need to be certified in another area and to take all basic teacher preparation courses. The growing number of English learners in our public schools make the ESL endorsement a useful addition to a teaching license.

To add English as a Second Language, students must earn credits in the following courses. In some cases, relevant special topics courses

or experimental courses may be substituted. Some courses have prerequisites. Endorsement requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

ENGL 219	Introduction to Linguistics	3
ENGL 220	Descriptive English Grammar	3
ENGL 425	Second Language Learning and Teaching	3
ENGL 322	Language and Society	3
or EDUC 420	Bilingualism & The Education of Latinx Youth	
or EDUC 520	Bilingualism & The Education of Latinx Youth	
ENGL 318	Introduction to ESL methods and materials	6
& ENGL 324	and Introduction to Teaching ESL Literacy (ENGL/ LING 318, ENGL/LING 324)	
OR		
ENGL 324	Introduction to Teaching ESL Literacy	6
& ENGL 325	and Teaching Methods for ESL Learners: Oral Communication Skills (ENGL/LING 324, ENGL/ LING 325)	
Practicum courses taken through the School of Education at ISU		
EDUC 280S	Pre-Student Teaching Experience I: English as a Second Language (ESL)	1
EDUC 480S	Pre-Student Teaching Experience III: English as a Second Language (ESL)	2

Reading Endorsement Requirements

At Iowa State University, the 5-12 reading endorsement is an add-on endorsement, which means that students need to be certified in another area and to take all basic teacher preparation courses. The reading endorsement is a useful addition to a teaching license.

To add a Reading Endorsement, students must earn credits in the following courses. In some cases, relevant special topics courses or experimental courses may be substituted. Some courses have prerequisites. Some courses may apply to both the English major and to the Reading Endorsement. Endorsement requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

ENGL 219	Introduction to Linguistics	3
or LING 471	Language and Reading Development in Children	
EDUC 395	Teaching Disciplinary Literacy	3
or EDUC 551	Foundations of Reading and Language Arts	
ENGL 396	Teaching the Reading of Young Adult Literature	3

or EDUC 459	Critical Approaches to Teaching Children's and Adolescent Literature	
ENGL 397	Practice and Theory of Teaching Writing in the Secondary Schools	3
EDUC 452/552	Assessment for Literacy and Learning	3
EDUC 456/556	Integrating Technology into Literacy	3
or EDUC 553	Teaching Adolescents who Struggle with Reading	
ENGL 494	Practice and Theory of Teaching Literature in the Secondary Schools	3
EDUC 488/588	Supervised Tutoring in Reading	3
<b>Total Credits</b>		<b>24</b>

## English, B.A., B.S.

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 Social Science Choice	3
Humanities Choice	3 Natural Science Choice	3
Social Science Choice	6 Humanities Choice	3
World Language/Elective	3-4 Math Choice	3
LIB 160	1 World Language/Elective	4
<b>16-17</b>		<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ENGL 250	3 Texts & Lang. Course 200-level (Group A)*	3
Texts & Lang. Course 200-level (Group A)*	3 Crit. Reading & Text. Analysis (Group B)*	3
Natural Science Group	3 Texts & Lang. Course 200-level (Group A)*	3
Texts & Lang. Course 200-level (Group A)*	3 Natural Science Choice	3
Humanities Choice	3 ENGL 340s/352 - US Diversity*	3
LAS 203	1	
<b>16</b>		<b>15</b>

### Junior

Fall	Credits Spring	Credits
ENGL Advanced Communication (Group C)*	3 Crit. Reading & Text. Analysis (Group B)*	3
Texts & Lang. Course 200-level (Group A)*	3 ENGL Elective 400+ (Group D)*	3
ENGL Elective 300+ (Group D)*	3 Electives/Courses in Minor	6

Elective/Course for Minor	3 ENGL Elective 300+ (Group D)*	3
Humanities Choice	3	
<b>15</b>		<b>15</b>

### Senior

Fall	Credits Spring	Credits
ENGL 400+ (Group D)*	3 Electives	12
Electives	3 ENGL 400+ (Grp D)	3
Electives/Course for Minor	6	
<b>12</b>		<b>15</b>

**Total Credits: 120-121**

\* See English Advisor for a list of courses suited to major groups A, B, C, & D and other distributed requirements that must be met.

## English, B.A. - English Education

### Freshman

Fall	Credits Spring	Credits
ENGL 150 (or waiver)	3 Humanities Choice	3
Humanities Choice	3 ENGL 250	3
PSYCH 230	3 EDUC 219	1
POL S 111	3 MATH 104, 105, 150, STAT 101, or STAT 104 (or any Math higher than 150)	3-4
or American History selection	World Language 102 or waiver	4
World Language 101 or waiver	4 EDUC 204	3
LIB 160	1	
<b>17</b>		<b>17-18</b>

### Sophomore

Fall	Credits Spring	Credits
ENGL 220	3 Literature Survey – ENGL 225-228	3
ENGL 260 (or ENGL 201)	3 ENGL 396	3
Natural Science Elective	3 ENGL 219	3
Literature Survey – ENG 225–228	3 EDUC 202	3
Humanities or Social Science Choice	3 ENGL 310 or 339	3
SP CM 212 or THTRE 358	3 or SP CM 300+ course	



EDUC 280L (Apply to Teacher Preparation Program)	0.5 LAS 203	1
Maintain 2.5+ GPA		
	<b>18.5</b>	<b>16</b>
<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
EDUC 406	3 EDUC 333 or PSYCH 333	3
Advanced Communication Choice	3 ENGL 354	3
SP ED 401	3 ENGL 397	3
Literature Survey – ENGL 225-228	3 ENGL 420	3
EDUC 395	3 Literature Survey – ENGL 225-228	3
Natural Science Elective	3 EDUC 380A	1-2
	Apply to take English 494	
	<b>18</b>	<b>16-17</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 494	3 ENGL 417E (same as EDUC 417E)	16
ENGL 353	3	
Env/Soc Justice Literature elective-ENGL 340 Series	3	
Natural Science Elective	3	
EDUC 480E	2	
EDUC 426	3	
Apply for Student Teaching		
	<b>17</b>	<b>16</b>

**Total Credits: 135.5-137.5**

## English Minor Requirements

The minor in English prepares students in any discipline for which communication activities are needed to succeed in their professions. Minors in English will complete 15 credits beyond ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition; ENGL 250 and additional courses require a grade of C or higher (not C-), 9 of which will be at the 300 or 400 levels. Twelve of these hours must be taken at Iowa State. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## GRADUATE STUDY

The Department of English offers graduate work leading to three Master of Arts degrees, one Master of Fine Arts degree, two Doctor of Philosophy degrees, and one TESL/TEFL Certificate. The department also offers two concurrent degree programs in which undergraduate students can earn a Master of Arts degree with one additional year of study. Information on application requirements and procedures for all majors is available on the Graduate Studies “How To Apply” (<http://www.engl.iastate.edu/graduate-students/prospective-students/how-to-apply-2/>) website.

The MA in English (<https://www.engl.iastate.edu/english/>) degree program offers advanced study of literature, film, research, writing, and the teaching of reading. Students admitted to the MA in English choose between two areas of specialization: (1) Literature or (2) Literature and the Teaching of Reading. These tracks prepare students for a variety of career paths, including teaching at the secondary or college levels, publishing, research, administration, and work in nonprofit sectors. For individuals interested in pursuing research at the PhD level and/or teaching at the high school, college, or university level, the specialization in Literature provides excellent preparation through this program’s small class sizes, research opportunities, and professionalization. The specialization in Literature and the Teaching of Reading is designed for licensed teachers who wish to take graduate literature courses and work toward a reading endorsement by taking three reading courses in Education.

The MA in Rhetoric, Composition, and Professional Communication (RCPC) (<https://engl.iastate.edu/ma-coursework-program-of-study/>) prepares students for careers as professional communicators, including careers in technical and business writing, web design, web usability, and technical editing. Graduates also are prepared to teach writing, including business and technical communication, at the postsecondary level. Students can choose to complete a thesis or one of two creative-component options.

The MA in TESL/Applied Linguistics (TESL/AL) (<https://apling.engl.iastate.edu/ma-program-in-tesl-applied-linguistics/>) prepares students for careers in teaching English to non-native speakers of English, either in the U.S. or abroad. Students with MA degrees in TESL teach adults and younger learners in a wide variety of contexts, supervise language programs, work for testing organizations, and create language teaching materials. Students admitted to the degree program can use their elective courses to pursue extended expertise in areas such as Computer-Assisted Language Learning, Language Assessment, English for Specific Purposes (ESP), or Corpus and Computational Linguistics. The MA in TESL/Applied Linguistics (<https://apling.engl.iastate.edu/ma-program-in-tesl-applied-linguistics/>) has a foreign language requirement that may be fulfilled in a number of ways. Students whose native language is other than English are considered to

have met the language requirement after satisfying the Graduate College English requirement. For undergraduates at ISU, the MA in TESL/AL can also be completed through the concurrent degree option, which allows linguistics majors who meet admissions requirements to pursue an MA degree in TESL/AL with just one additional year of study.

The Master of Arts (MA) degree programs require a minimum of 30 hours of graduate credit, including a final thesis or creative component (3 credits).

The Master of Fine Arts (MFA) program in Creative Writing and Environment (CWE) (<https://www.engl.iastate.edu/creative-writing/mfa-program-in-creative-writing-and-environment/>) cultivates in its students an interdisciplinary approach to research and writing. The program's unique design allows writers to develop a heightened environmental imagination that finds expression in quality, publishable works of fiction, nonfiction, poetry, and drama. The program is designed to prepare students for careers as writers, teachers, editors, and environmental educators. The MFA degree requires 54 hours of graduate credit: a core of creative writing and other English courses, a book-length thesis (6 credits), experiential environmental fieldwork (3 credits), and 12 credits in disciplines other than English (such as Landscape Architecture, Anthropology, or Environmental Science, among many others) relevant to an individual student's research interests and thesis project.

The Doctor of Philosophy (PhD) in Applied Linguistics and Technology (ALT) (<https://apling.engl.iastate.edu/ph-d-in-applied-linguistics-and-technology/>) focuses on English language description, teaching, learning, and assessment, with particular emphasis on issues and practices related to technology: analysis of language using computational and corpus linguistic methods as well as the study of computer technology in English language teaching, learning, assessment, and second language pronunciation. The degree prepares students for a variety of academic appointments in departments of applied linguistics and English and for professional opportunities in research and development, international publishing, and government agencies in the U.S. and around the world where English is taught and used for specific educational, vocational, and professional purposes. Candidates are required to complete 72 hours of graduate credit including a dissertation, to meet a foreign language requirement that may be fulfilled in a number of ways (students whose native language is other than English are considered to have met the language requirement after satisfying the Graduate College English requirement), and to pass a portfolio assessment, a preliminary examination (consisting of a dissertation proposal and an oral defense of the proposal), and an oral defense of the completed dissertation.

The PhD in Rhetoric and Professional Communication (RPC) (<https://www.engl.iastate.edu/rpc/graduate-programs/phd-rpc/>) applies rhetorical theory to the practice of written, oral, and visual communication in professional communities (e.g., industry and science)

and in public spaces that frame deliberation, controversy, and communal identity. The degree prepares graduates for academic positions in rhetoric, in multimodal composition, and in business, professional, and technical communication, as well as for work in the private and public sectors as professional communication specialists, editors, designers, and communication managers. Candidates are required to complete 72 hours of graduate credit, including a dissertation, and to pass a portfolio assessment, a preliminary examination, and an oral defense of the dissertation.

A Graduate Certificate in Teaching English as a Second Language/ Teaching English as a Foreign Language (TESL/TEFL) (<https://apling.engl.iastate.edu/tesltefl-graduate-certificate/>) prepares students to teach English to non-native speakers of English either in the U.S. or abroad. It offers students grounding in the linguistic understanding of English and a flexible program of study with courses in teaching methodology, language assessment, and the use of technology to address students' language needs. This 12-credit program has two prerequisites, one core requirement, and three graduate course electives.

The department offers qualified graduate students an opportunity to gain professional experience through teaching and research assistantships, fieldwork and internships, and departmental research activities. Graduate teaching assistants are responsible for teaching, with faculty supervision, courses in ISUComm Foundation Courses, ISUComm Advanced Communication (business and technical communication), ISUComm Speech Communication, and English as a Second Language (ESL). Research assistants may be assigned to faculty members engaged in research projects. Various admissions awards are available as well: the Janet Anderson-Hsieh Scholarship is awarded each year to one Applied Linguistics and Technology doctoral student; one or more Pearl Hogrefe Fellowships in Creative Writing (<https://www.engl.iastate.edu/creative-writing/how-to-apply/pearl-hogrefe-fellowship-in-creative-writing/>), covering stipend and tuition, are awarded each year to outstanding graduate students; Freda Huncke Endowment Graduate Teaching Fellowships are awarded to select students each year.

The English Department offers minors in each of its graduate programs. A graduate minor at the MA level requires 9 credits of English at the 500 or 600 level in the respective major (English, RCPC, TESL/AL). A graduate minor within the MFA program in Creative Writing and Environment requires an approved application and completion of 12 graduate credits of creative writing. A graduate minor at the PhD level requires 12 credits at the 500 or 600 level in the respective major (ALT or RPC).

## GRADUATE PROGRAM LEARNING OUTCOMES

### MA in English

- Expand knowledge related to the study of literature and film that includes a diversity of authors/directors, genres, theories, and cultural-historical contexts.
- Communicate research effectively through oral and written presentations.
- Conduct independent scholarship in ways that consistently demonstrate ethical practice and professionalism.
- For graduate students who receive a teaching assistantship, develop strategies for the effective teaching of undergraduate students.

### MA in Rhetoric, Composition, and Professional Communication

The RCPC program combines the pedagogy focus of a degree in rhetoric and composition with the technical skill and practicality of a degree in professional communication. Upon graduation, students will demonstrate the ability to

- understand the interplay of rhetoric, composition, and professional communication in local and global contexts.
- analyze a rhetorical situation and develop communication that responds to it effectively and ethically.
- develop communication that helps build a socially just society.
- use communication to contribute to an affirming and inclusive classroom/workplace environment.
- apply the historical and theoretical understanding necessary to assess the use of specific communication technologies within complex organizations.
- combine verbal and visual communication skills to produce effective communication in contemporary organizations.

Measures for evaluating a student's success in meeting these objectives include

- achievement on coursework
- familiarity with useful and common software programs and technologies
- successful completion of a thesis or a creative-component project

### MA in TESL/Applied Linguistics

- Demonstrate independence, reflective practices, and professionalism in teaching and assessment of English as a second language.
- Demonstrate knowledge of and confidence with the use of computer applications relevant to English language teaching.

- Formulate important research questions for guiding investigations that contribute to theory and practice in one or more areas of applied linguistics.
- Carry out research in one area of applied linguistics that will increase understanding of English language teaching.
- Evaluate research in the field to identify its contribution to theory, research, and practice in applied linguistics.
- Communicate ideas, discoveries, and findings to others in a professional and creative manner.
- Collaborate with other professionals to create and investigate new knowledge, practices, and products for English language teaching.

### MFA in Creative Writing and Environment

- Demonstrate understanding of craft and professional practice through coursework, workshops, and completion of refined imaginative literary manuscripts in multiple genres.
- Identify, research, and examine—through coursework, fieldwork, and literary practice—the natural world and the environmental imagination.
- Broaden and deepen understanding of literary and theoretical traditions of the major genres and the methodologies of craft analysis and practice.
- Broaden and deepen understanding of the cultural and natural environment through significant coursework in environmental courses available at Iowa State University both within and beyond the MFA program and English department.
- Design, write, workshop, refine, and defend a significant body of publishable- or production-quality imaginative writing, including a full-length thesis manuscript, which demonstrates professional understanding and application of craft and technique, literary tradition, and the environmental imagination.
- Gain practical training and experience in creating and fostering a healthy literary community and sustaining a professional life in letters through teaching and research assistantships and internships, literary journal editorial internships and positions, as well as land stewardship, reading series, and other outreach opportunities.

### PhD in Applied Linguistics and Technology

- Demonstrate knowledge of and confidence with the use of computer applications relevant to teaching, learning, research, and assessment in applied linguistics.
- Design, implement, and evaluate algorithms for automating linguistic analysis tasks based on knowledge of natural language and speech processing programming.
- Formulate important research questions for guiding investigations that contribute to theory and practice in one or more areas of applied linguistics.

- Apply principles of research methodology to design data collection and analysis procedures to address research questions in at least one area of applied linguistics.
- Interpret and evaluate findings in view of their contribution to theory, research, and practice in the relevant area.
- Communicate ideas, discoveries, and findings to others in a professional and creative manner.
- Collaborate with other professionals to create and investigate new knowledge, practices, and products.
- Demonstrate independence and professionalism in teaching and research.

## PhD in Rhetoric and Professional Communication

At the time of graduation, RPC students will demonstrate an ability to

- understand theories, research methods, and concepts in rhetoric, professional communication, and multimodal composition.
- apply these theories, research methods, and concepts in scholarly activity, including research and teaching.
- use a variety of technologies and media for scholarly research and for developing audience-centered communication.
- analyze, synthesize, and critique communication in a variety of organizational and public contexts.
- analyze, synthesize, and critique research related to rhetoric, professional communication, and multimodal composition.
- develop scholarship that makes a significant contribution to the field.
- develop communication that helps build a socially just society.

Measures for evaluating a student's success in meeting these objectives include

- display of an ability to develop a clear and cogent argument using relevant evidence in coursework
- annual reviews
- qualifying examination (i.e., portfolio assessment)
- preliminary exams (written and oral)
- completion and defense of a dissertation

## Graduate Certificate in TESL/TEFL

- Demonstrate growth in reflective practice and professionalism in English language teaching.
- Demonstrate metalinguistic knowledge of English structure and use.
- Evaluate research in the field to identify its contribution to English language teaching practice.
- Communicate and collaborate with others to achieve professional goals for English language teaching.

## Environmental Science Interdepartmental Undergraduate Programs

Environmental Science provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems. The magnitude and complexity of environmental problems are creating a growing need for scientists with rigorous, interdisciplinary training in environmental science. The Environmental Science program is designed to prepare students for positions of leadership in this rapidly changing discipline. Environmental Science graduates have a solid foundation in biological and physical natural sciences and the specialized training necessary for integrated analysis of environmental systems.

### Undergraduate Study

The Environmental Science undergraduate major is offered through both the College of Agriculture and Life Sciences and the College of Liberal Arts and Sciences. Environmental Science majors complete foundation courses in natural sciences and mathematics, plus a major consisting of an integrated core of Environmental Science courses and additional advanced course work in Environmental Science. Scientific rigor is stressed throughout the program, beginning with the foundation courses in the first two years of the curriculum. The upper level core courses emphasize a dynamic systems approach that provides a framework for integrating physical, chemical, and biological aspects of environmental systems. Beyond the required core, students select from a broad array of advanced courses to either develop greater breadth, or specialization in areas including, but not limited to, water resources, climate impacts and adaptation, environmental restoration and management, and geographic information systems (see <https://www.ensci.iastate.edu/> for additional information on areas of specialization).

### Student Learning Outcomes

Upon graduation, students should be able to:

Demonstrate a broad understanding of environmental systems and issues utilizing an interdisciplinary framework to integrate ideas and concepts from biological and physical natural sciences

Demonstrate proficiency in data analysis and problem-solving of relevant environmental systems/problems

Use a systems approach to conduct integrated, quantitative, and interdisciplinary analyses and modeling of environmental systems and problems

College of Liberal Arts and Sciences

<http://www.ensci.iastate.edu>

Students seeking an Environmental Science major complete the following:

1. A foundation of approved supporting courses in science and mathematics including biology, chemistry, earth science, physics, mathematics, and statistics.

2. 33 credits of course work in the major, including a required core of 21 credits.

A combined average grade of C or higher is required in courses applied in the major.

### 1. Environmental Science: 33 credits

ENSCI 110	Orientation to Environmental Science	1
ENSCI 201	Introduction to Environmental Issues	2
ENSCI 202	Exploration of Environmental and Sustainability Issues	1
ENSCI 203	Exploration of Environmental Science	1
ENSCI 250	Environmental Geography	3
ENSCI 251	Biological Processes in the Environment	3
ENSCI 312	Ecology	4
ENSCI 318	Introduction to Ecosystems	3
ENSCI 319	Analysis of Environmental Systems	3
Additional ENSCI choice courses		12
<b>Total Credits</b>		<b>33</b>

### 2. Mathematics & Statistics: 6-8 credits

Choose one of the following: 3-4

MATH 104	Introduction to Probability	
MATH 150	Discrete Mathematics for Business and Social Sciences	
MATH 151	Calculus for Business and Social Sciences	
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
COM S 106	Introduction to Web Programming	
COM S 107	Windows Application Programming	
DS 201	Introduction to Data Science	
DS 202	Data Acquisition and Exploratory Data Analysis	

Choose one of the following: 3-4

STAT 101	Principles of Statistics	
STAT 104	Introduction to Statistics	

**Total Credits** 6-8

### 3. Physical & Life Sciences: 21-24 credits

BIOL 211 Principles of Biology I 3

Choose from one of the following: 5-6

CHEM 163 College Chemistry  
& 163L and Laboratory in College Chemistry

CHEM 167 General Chemistry for Engineering Students  
& 167L and Laboratory in General Chemistry for Engineering

CHEM 177 General Chemistry I  
& 177L and Laboratory in General Chemistry I

CHEM 201 Advanced General Chemistry  
& 201L and Laboratory in Advanced General Chemistry

Choose from one of the following: 3-4

CHEM 231 Elementary Organic Chemistry  
& 231L and Laboratory in Elementary Organic Chemistry

CHEM 331 Organic Chemistry I  
& 331L and Laboratory in Organic Chemistry I

BBMB 221 Structure and Reactions in Biochemical Processes

AGRON 259 Organic Compounds in Plants and Soils

Choose 3 of the following: 9

AGRON 182 Introduction to Soil Science

AGRON 282 Soil Conservation and Land Use

GEOL 100 How the Earth Works

or GEOL 201 Geology for Engineers and Environmental Scientists

MTEOR 206 Introduction to Weather and Climate

BIOL 212 Principles of Biology II

CHEM 178 General Chemistry II  
& 178L and Laboratory in College Chemistry II

PHYS 115 Physics for the Life Sciences

or PHYS 131 General Physics I

or PHYS 231 Introduction to Classical Physics I

**Total Credits** 20-22

### 4. Communications: 7-10 credits

ENGL 150 Critical Thinking and Communication 3

ENGL 250 Written, Oral, Visual, and Electronic Composition 3

LIB 160 Introduction to College Level Research 1

Embedded communication coursework in ENSCI 203 and ENSCI 312

**Total Credits** 7

#### Additional communication courses required of majors in the College of Agriculture and Life Sciences

Choose 1 of the following: 3

SP CM 212 Fundamentals of Public Speaking

AGEDS 311 Presentation and Sales Strategies for Agricultural Audiences

COMST 214 Professional Communication

**Total Credits** 3

**5. General Education: 15-21 credits****Additional general education requirements in the College of Agriculture and Life Sciences**

Humanities	3
Social Science	3
Ethics	3
International Perspectives course from university approved list	3
US Diversity course from university approved list	3
<b>Total Credits</b>	<b>15</b>

**additional general education requirements in the College of Liberal Arts and Sciences**

Arts and Humanities courses from college approved list	12
Social Science courses from college approved list	9
(Select courses to include 3 cr. of International Perspectives and 3 cr. of US Diversity)	
Students must have completed 3 years of a single world language in high school or take 4-8 credits of World Languages at the university level	
LAS 203 Professional Career Preparation	1
<b>Total Credits</b>	<b>22</b>

**Electives (28-35 credits)**

As majors in the College of Liberal Arts and Sciences, Environmental Science students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

**Bachelor of Science B.S. (LAS)****Freshman**

Fall	Credits Spring	Credits
ENGL 150	3 ENSCI 203	1
ENSCI 110 <sup>1</sup>	1 BIOL 211	3
ENSCI 201	2 BIOL 211L (or elective)	1
ENSCI 202	1 CHEM 178	3
CHEM 177	4 CHEM 178L	1
CHEM 177L	1 Mathematics, Programming, or Data Science choice	3-4
STAT 101 or 104	3-4 Arts and Humanities choice <sup>2</sup>	3
LIB 160	1	
<b>16-17</b>		<b>15-16</b>

**Sophomore**

Fall	Credits Spring	Credits
ENSCI 250 <sup>1</sup>	3 ENSCI 251	3

Social science choice <sup>2</sup>	3 Organic chemistry choice <sup>3</sup>	3
ENGL 250	3 Physical or Life Science choice <sup>3</sup>	3
Physical or Life Science choice <sup>3</sup>	3 Arts and humanities choice <sup>2</sup>	3
Elective	1-2 Social science choice <sup>2</sup>	3
LAS 203	1 Summer: Consider field experience such as an internship or field station courses.	

**14-15 15****Junior**

Fall	Credits Spring	Credits
ENSCI 312	4 ENSCI 318	3
Environmental science choice <sup>1</sup>	3 ENSCI 319	3
Arts and humanities choice <sup>3</sup>	3 Arts and humanities choice <sup>2</sup>	3
Elective	3 Elective	3
Elective	1-2 Elective	3
Summer: Consider field experience such as an internship or field station courses.		

**14-15 15****Senior**

Fall	Credits Spring	Credits
Environmental science choice <sup>1</sup>	3 Environmental science choice <sup>1</sup>	3
Social science choice <sup>2</sup>	3 Environmental science choice <sup>1</sup>	3
Electives	9 Electives	9

**15 15**

Students in all ISU majors must complete a 3 credits in U.S. diversity and a 3 credits in international perspectives. Check the Environmental Science website (<http://www.ensci.iastate.edu>) for a list of approved courses.

Minimum of 120 credits required, including a minimum of 45 credits at the 300/400 level.

<sup>1</sup> Students complete at least 32 credits in Environmental Science including ENSCI 110, ENSCI 201, ENSCI 250, ENSCI 312, ENSCI 318, ENSCI 319 and 12 additional credits of approved ENSCI coursework.

<sup>2</sup> Students complete at least 12 credits in arts and humanities and 9 credits in social science from approved lists. These credits can also be used to meet the U.S. Diversity and International Perspectives requirements.



<sup>3</sup> Students choose one course from the following Physical or Life Science related courses: AGRON 182, AGRON 282, BIOL 212, CHEM 178 & CHEM 178L, GEOL 100, GEOL 201, MTEOR 206, PHYS 115, PHYS 131, PHYS 231. Students choose from one of the following Organic Chemistry options: CHEM 231 & CHEM 231L, CHEM 331 & CHEM 331L, BBMB 221, or AGRON 259.

Graduate Study

Contact information for the graduate program:

**Lynette Edsall**  
camelot@iastate.edu (mstolt@iastate.edu)  
515-294-1191  
<https://enscigrad.iastate.edu/>

The Environmental Science graduate program offers an interdepartmental curriculum leading to M.S. and Ph.D. degrees with a major in Environmental Science. Faculty from the colleges of Agriculture and Life Sciences, Engineering, and Liberal Arts and Sciences cooperate to offer courses and research opportunities covering a broad array of environmental topics. Cooperating departments include Agricultural and Biosystems Engineering; Agronomy; Animal Science; Civil, Construction and Environmental Engineering; Ecology, Evolution and Organismal Biology; and Geological and Atmospheric Sciences.

Applicants should have completed an undergraduate or master's degree in one of the biological, chemical, physical, or engineering sciences or should have equivalent preparation.

The Environmental Science Graduate Program emphasizes fundamental concepts and research, which at the same time address major environmental issues. The curriculum is designed to provide the interdisciplinary approach needed in environmental science education and research. In addition to work in their chosen area of specialization, students are afforded a broad exposure to the biological, chemical and physical aspects of environmental systems and the specialized training necessary for integrated analysis of these systems.

Information on application procedures, curriculum requirements, and faculty research areas is available on the Environmental Science Graduate Program website (<https://enscigrad.iastate.edu/>).

Environmental Studies  
Environmental Studies  
Interdepartmental Undergraduate Program

Environmental Studies deals with the relationship and interactions between humans and the environment. Students in any college at ISU may elect to take a secondary major or minor in Environmental Studies. The curriculum is designed to give students an understanding of current and emerging environmental issues and an appreciation of different

perspectives regarding these issues. Courses are provided for students pursuing careers related to the environment and for others who simply want to know more about environmental issues.

Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate a broad understanding and appreciation for a range of environmental issues spanning natural and human systems
- Demonstrate an understanding and appreciation of different perspectives regarding environmental issues
- Demonstrate an understanding of approaches used in addressing environmental problems including data analysis and problem-solving

Secondary Major

The Environmental Studies secondary major is taken in addition to a primary major and provides the breadth of preparation and integrated perspective necessary to understand environmental issues. Students seeking a major in Environmental Studies complete 24 credits of ENV S coursework including:

At least one general survey course chosen from:

ENV S 101	Environmental Geology: Earth in Crisis
ENV S 120	Introduction to Renewable Resources
ENV S 173	Environmental Biology
ENV S 201	Introduction to Environmental Issues

At least one integrative/issues course chosen from:

ENV S 160	Water Resources of the World
ENV S 204	Biodiversity
ENV S 324	Energy and the Environment
ENV S 342	World Food Issues: Past and Present
ENV S 404	Global Change
ENV S 424	Sustainable and Environmental Horticulture Systems
ENV S 450	Issues in Sustainable Agriculture

At least two human/societal perspectives courses chosen from:

ENV S 270	Foundations in Natural Resource Policy and History
ENV S 283	Introduction to Environmental Politics and Policies
ENV S 293	Environmental Planning
ENV S 320	Ecofeminism
ENV S 334	Environmental Ethics
ENV S 345	Population and Society
ENV S 355	Literature and the Environment
ENV S 363	U. S. Environmental History
ENV S 380	Energy, Environmental and Resource Economics

ENV S 382	Environmental Sociology
ENV S 484	Sustainable Communities
ENV S 491	Environmental Law and Planning

Beyond these three requirements, any Environmental Studies course and up to six credits of approved environmental coursework outside of Environmental Studies may be applied toward the 24 credit total for the major. Regardless of their home college, Environmental Studies majors must complete at least 9 credits in natural sciences from the LAS General Education approved course list. Unless prohibited by program or college rules, courses used to fulfill requirements of the Environmental Studies major may also be used to satisfy general education and other requirements of departments and colleges. A combined average grade of C or higher is required in courses applied to the major.

## Minor

Students seeking a minor in Environmental Studies complete 15 credits of approved Environmental Studies coursework including:

At least one general survey course chosen from:

ENV S 101	Environmental Geology: Earth in Crisis
ENV S 120	Introduction to Renewable Resources
ENV S 173	Environmental Biology
ENV S 201	Introduction to Environmental Issues

At least one integrative/issues course chosen from:

ENV S 160	Water Resources of the World
ENV S 204	Biodiversity
ENV S 324	Energy and the Environment
ENV S 342	World Food Issues: Past and Present
ENV S 404	Global Change
ENV S 424	Sustainable and Environmental Horticulture Systems
ENV S 450	Issues in Sustainable Agriculture

At least two human/societal perspectives courses chosen from:

ENV S 270	Foundations in Natural Resource Policy and History
ENV S 283	Introduction to Environmental Politics and Policies
ENV S 293	Environmental Planning
ENV S 320	Ecofeminism
ENV S 334	Environmental Ethics
ENV S 345	Population and Society
ENV S 355	Literature and the Environment
ENV S 363	U. S. Environmental History
ENV S 380	Energy, Environmental and Resource Economics
ENV S 382	Environmental Sociology

ENV S 484	Sustainable Communities
ENV S 491	Environmental Law and Planning

A combined average grade of C or higher is required in courses applied to the minor, and the minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Genetics

Genetics is the scientific study of heredity. Understanding the basis of heredity is fundamental to all aspects of the life sciences, from the most basic molecular study to applied studies of agricultural species. At Iowa State University the study of the life sciences is interdepartmental, involving faculty in the basic, agricultural, and veterinary sciences. Faculty in 20 different departments are involved in genetics research. This large group of faculty presents a broad range of possibilities for students to learn from faculty who are at the forefront of research in many areas of genetics.

## UNDERGRADUATE STUDY

Undergraduate study in genetics is jointly administered by three departments: the Roy J. Carver Department of Biochemistry, Biophysics, and Molecular Biology; the Department of Genetics, Development, and Cell Biology; and the Department of Ecology, Evolution, and Organismal Biology. Undergraduate degrees are offered through both the College of Agriculture and Life Sciences and the College of Liberal Arts and Science. Programs of study for genetics majors leading to a B.S. degree are available.

Training in genetics may lead to employment in teaching, research, or a variety of health-related professions. Although some students find employment directly after their baccalaureate training, many students continue their education in graduate or professional programs. Students with the B.S. degree may find employment in the biotechnology, health, or food industries. Recent graduates have also developed careers in conservation biology, technical writing, science journalism, technical sales, and business.

The required course work and associated electives provide students with the foundation in basic life sciences, mathematics, chemistry, and physics that is essential for professions involving modern biological/biomedical sciences. As part of these courses students develop skills in problem solving, critical thinking, writing, and research-related activities in the biological sciences.

Specific entrance requirements for medical and health-related professions are established by the professional schools. Students interested in fulfilling pre-professional requirements for such professions as dentistry, human medicine, genetic counseling, optometry, pharmacy,

physical therapy, physicians assistant, and veterinary medicine can major in genetics while fulfilling the pre-professional requirements.

Student Learning Outcomes:

Upon graduation, students earning the BS degree in Genetics are expected to have achieved the following skills and capabilities:

- Comprehensive, detailed understanding of the chemical basis of heredity.
- Comprehensive and detailed understanding of genetic methodology and how quantification of heritable traits in families and populations provides insight into cellular and molecular mechanisms.
- Understanding of how genetic concepts affect broad societal issues including health and disease, food and natural resources, environmental sustainability, etc.
- Understanding the role of genetic mechanisms in evolution.
- The knowledge required to to design, execute, and analyze the results of genetic experimentation in animal and plant model systems.
- The ability to recognize the experimental rationale of genetic studies as they are described in peer-reviewed research articles and grant proposals to federal and other funding agencies.
- The ability to evaluate conclusions that are based on genetic data.
- Insight into the mathematical, statistical, and computational basis of genetic analyses that use genome-scale data sets in systems biology settings.
- Understanding the role of genetic technologies in industries related to biotechnology, pharmaceuticals, energy, and other fields.
- Communication skills required in the discipline including oral presentations of research data, published research articles, grant proposals, and poster presentations at conferences.
- Teamwork and leadership skills including group analysis of data, working together in the research laboratory, joint compositions of written reports, substantive participation in research group meetings, etc.

CURRICULUM IN GENETICS - REQUIREMENTS

Total Degree Requirement: 120 cr.

A maximum of 65 cr. from a two-year institution can be applied that may include up to 16 technical cr.; up to 9 Pass-Not Pass cr. of free electives can be applied; a cumulative GPA of at least 2.0 is required for graduation. Program-approved lists can be found on the Genetics website.

1. Genetics and Life Sciences

A grade of C– or better is required in all Genetics and Life Science courses.

A. Courses required of all Genetics majors

GEN 110	Genetics Orientation	1
BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 315	Biological Evolution	3
One of the following:		3-4
GEN 322	Introduction to Bioinformatics and Computational Biology	
GEN 349	The Genome Perspective in Biology	
BCBIO 406	Bioinformatics of OMICS	
GEN 409	Molecular Genetics	3
GEN 410	Analytical Genetics	3
One of the following:		3
GEN 462	Evolutionary Genetics	
EEOB 561	Evolutionary and Ecological Genomics	
EEOB 563	Molecular Phylogenetics	
GEN 491	Undergraduate Seminar, Professional Practice in Genetics Disciplines	1
MICRO 302	Biology of Microorganisms	3
Total Credits		35-36

B. Course required of majors in the College of Agriculture and Life Sciences only

A minimum of 3 cr. of coursework in the area of environmental science from program approved list	3
Total Credits	3

2. Advanced Sciences Electives: 6 cr. from program approved list

A grade of C- or better is required in each course. No more than 3 cr. of GEN 490, 490R, 490H, 492, 496, 499, or 499H may be used to meet this requirement.

3. Mathematical Sciences

Complete at least one calculus course from MATH, minimum of 4 credits.		4
MATH 160	Survey of Calculus	
MATH 165	Calculus I	
Complete at least one course from STAT, minimum of 3 credits.		3-4
STAT 101	Principles of Statistics	

STAT 104	Introduction to Statistics	
Complete at least one additional course from MATH or STAT, minimum of 4 credits.		4
MATH 166	Calculus II	
STAT 301	Intermediate Statistical Concepts and Methods	
<b>Total Credits</b>		<b>11-12</b>

#### 4. Supporting Sciences

CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
CHEM 332	Organic Chemistry II	3
CHEM 332L	Laboratory in Organic Chemistry II	1
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
PHYS 132	General Physics II	4
PHYS 132L	General Physics II Laboratory	1
Choose one of the following options		6-7

##### Option 1

BBMB 404	Biochemistry I	
And one of the following:		
BBMB 405	Biochemistry II	
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	

##### Option 2

BBMB 420	Mammalian Biochemistry	
And one of the following:		
BBMB 411	Techniques in Biochemical Research	
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	
CHEM 325	Chemical Thermodynamics	

<b>Total Credits</b>		<b>33-34</b>
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#### 5. International Perspectives: 3 cr. from university approved list

This course can satisfy **both** the university requirement for International Perspectives and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

#### 6. U.S. Diversity: 3 cr. from university approved list

This course can satisfy **both** the university requirement for U.S. Diversity and the college requirement for a General Education elective (item 8) if the selection appears on both lists of approved courses.

#### 7. Communications/Information Literacy

##### A. Courses required of all Genetics majors

Grades of C or better are required in ENGL 250 and advanced writing. (The College of Agriculture and Life Sciences requires a C or better in ENGL 150, as well.)

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
LIB 160	Introduction to College Level Research	1
One advanced English writing course from program approved list		3
<b>Total Credits</b>		<b>10</b>

##### B. Course required of majors in the College of Agriculture and Life Sciences only.

A grade of C or better is required by the college.

SP CM 212	Fundamentals of Public Speaking	3
or AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	
<b>Total Credits</b>		<b>3</b>

#### 8. General Education electives

Courses from college approved lists that also appear on university approved lists of U.S. Diversity or International Perspectives courses can be used to satisfy both requirements.

##### A. College of Agriculture and Life Sciences

Humanities course from college approved list		3
Social Science course from college approved list		3
Ethics course from college approved list		3
<b>Total Credits</b>		<b>9</b>

##### B. College of Liberal Arts and Sciences

Humanities courses from college approved list; one of these should be a Science/Humanities bridge course from program approved list

Social Science courses from college approved list		9
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Students must have completed 3 years of a single world language in high school or take 4-8 credits of World Languages at the university level.

**Total Credits** **21**

As majors in the College of Liberal Arts and Sciences, Genetics (LAS) students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

Genetics, B.S.

#### Freshman

Fall	Credits	Spring	Credits
GEN 110		1 BIOL 211	3
BIOL 212		3 BIOL 211L	1
BIOL 212L		1 CHEM 178	3
CHEM 177		4 MATH/ STAT or college requirement choice	3-4
CHEM 177L		1 ENGL 250 or college requirement choice	3
MATH/ STAT choice		3-4 LIB 160	1
ENGL 150 or 250		3 (or semester 1 with ENGL 250)	
LIB 160		1 Consider Research	1-2
(if taking ENGL 250)			
<b>17-18</b>		<b>15-17</b>	

#### Sophomore

Fall	Credits	Spring	Credits	Summer	Credits
BIOL 313		3 BIOL 314		3 Consider Internship, Study Abroad	
BIOL 313L		1 CHEM 332		3	
CHEM 331		3 CHEM 332L		1	
CHEM 331L		1 MICRO 302 or BIOL 315 (or Bioinformatics/ Genomics Choice)		3	
College requirement or Elective		3 MATH/ STAT or college requirement choice		3-4	
MATH/ STAT choice		3-4 College Requirement or Elective		3	
14-15			16-17		0
Junior					
Fall	Credits	Spring	Credits		
GEN 409		3 GEN 410		3	
BBMB 404*		3 PHYS 132 or 232*		4	
PHYS 131 or 231*		4 PHYS 132L or 232L*		1	
PHYS 131L or 231L*		1 BBMB 405*		3	
MICRO 302 or BIOL 315 (or Bioinformatics/ Genomics Choice)		3 MICRO 302 or BIOL 315 (or Bioinformatics/ Genomics Choice)		3	
College Requirement or Elective		3 GEN 491		1	
17			15		

**Senior**

Fall	Credits	Spring	Credits
GEN 462		3 Advanced Science Elective(s)	3-6
Advanced science elective or STAT 301		3-4 College Requirement or Elective	3
College Requirement or Elective		1-6 Elective or STAT 301	3-4
Advanced Writing (ENGL 302-316)		3 College Requirement or Elective	3
<b>10-16</b>		<b>12-16</b>	

**Total Credits: 116-131**

\* Summer: Students taking the MCAT need to have completed biochemistry and physics by this time. Others can complete during the senior year.

## Undergraduate Minor

The minor in Genetics may be earned by completing the following courses. At least 9 cr. must be used **only** to fulfill the requirements of the minor and not be applied to any other major, college, or university requirement.

GEN 313	Principles of Genetics	3
GEN 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
GEN 410	Analytical Genetics	3
GEN 409	Molecular Genetics	3
Two or more additional credits in Genetics at the 300 level or above.		2
<b>Total Credits</b>		<b>15</b>

## Geology

The **bachelor of science major in Geology** prepares the student for a professional career and/or graduate study in the geological sciences. Graduates work to understand natural processes on Earth and other planets. They are able to apply their knowledge of forces and factors that shape the Earth to reconstruct past environments and anticipate future problems. Graduates provide essential information for solving problems for resource management, environmental protection, and public

health, safety, and welfare. They work as consultants on engineering and environmental problems, explorers for new minerals and hydrocarbon resources, researchers, staff members in state and U.S. geological surveys, government regulators, teachers, writers, editors, and museum curators. Graduates are able to integrate field and laboratory data and to prepare reports. They are able to make presentations that include maps and diagrams that illustrate the results of their studies.

**Geology as an Additional Major:** The Geology program has identified the core of 31 credits of geology courses that can complement a BS degree or major in materials engineering, civil engineering, environmental science, meteorology, or biology for students wishing to earn an additional major in geology. This pathway to earning a Geology major allows students in these academic programs with affinity to geology to complete both programs. Students should work closely with their advisors in each department to ensure that all requirements are met. These programs prepare students for careers or graduate study in the geosciences.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate the ability to think critically;
- Exhibit a broad understanding of Earth systems and processes;
- Demonstrate scientific literacy and its application to scientific inquiry and societal concerns;
- Demonstrate proficiency in data collection, management, and analysis including understanding sources of error and/or uncertainty;
- Demonstrate competency with geoscience-specific techniques and field methods.
- Read and critically evaluate relevant literature and information;
- Use appropriate tools from chemistry, physics, biology, mathematics, and data science to solve discipline-specific problems;
- Present information effectively in written and oral forms;
- Work in a team environment in alignment with the ISU principles of community;
- Work independently;
- Attain employment in the geosciences or related fields, or pursue graduate studies.

**Combined Degrees:** A concurrent program is offered which combines a bachelor of science degree in geology and a master of science degree in geology.

## Geology

### Required courses for BS in Geology include:

GEOL 100	How the Earth Works	3
or GEOL 101	Environmental Geology: Earth in Crisis	



or GEOL 201	Geology for Engineers and Environmental Scientists	
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 102	History of the Earth	3
GEOL 102L	History of the Earth: Laboratory	1
GEOL 302	Summer Field Studies	6
GEOL 315	Mineralogy and Earth Materials	3
GEOL 315L	Laboratory in Mineralogy and Earth Materials	1
GEOL 316	Optical Mineralogy	1
GEOL 356	Structural Geology and Tectonics	4
GEOL 357	Geological Mapping and Field Methods	1
GEOL 365	Igneous and Metamorphic Petrology	3
GEOL 368	Sedimentary Geology	4
GEOL 479	Surficial Processes	3
And 9 credits of geology electives at the 300+ level.		9
<b>Total Credits</b>		<b>43</b>

### Required supporting courses include:

MATH 165	Calculus I	4
MATH 166	Calculus II	4
CHEM 177	General Chemistry I	4
CHEM 177L	Laboratory in General Chemistry I	1
CHEM 178	General Chemistry II	3
CHEM 178L	Laboratory in College Chemistry II	1
PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
PHYS 132	General Physics II	4
PHYS 132L	General Physics II Laboratory	1
And 6 additional credits of either geology electives or courses from an approved departmental list of science, engineering, and mathematical disciplines outside of geology.		6
<b>Total Credits</b>		<b>33</b>

**Geology as an Additional Major:** The requirements of the 31 credit core are below. Please review information on the department website and contact the current program head for more information and sample four year plans for the Geology as an additional major program.

### Required courses in Geology as an Additional Major

GEOL 100	How the Earth Works	3
or GEOL 101	Environmental Geology: Earth in Crisis	
or GEOL 201	Geology for Engineers and Environmental Scientists	
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 102	History of the Earth	3
GEOL 102L	History of the Earth: Laboratory	1

GEOL 302	Summer Field Studies	6
GEOL 315	Mineralogy and Earth Materials	3
GEOL 315L	Laboratory in Mineralogy and Earth Materials	1
GEOL 316	Optical Mineralogy	1
GEOL 356	Structural Geology and Tectonics	4
GEOL 357	Geological Mapping and Field Methods	1
GEOL 365	Igneous and Metamorphic Petrology	3
GEOL 368	Sedimentary Geology	4
<b>Total Credits</b>		<b>31</b>

No more than 9 credits in 490 may be counted toward a degree in Geology.

**Communication Proficiency requirement:** According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. The department requires a grade of C or better in ENGL 309 or ENGL 314.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
One of the following:		3
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>9</b>

As majors in the College of Liberal Arts and Sciences, Geology students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. At least 8 credits in the major from 300+ courses must earn grade C or better. The average grade of all courses in the major must be 2.0 or higher. You must also complete the LAS world language requirement and LAS career proficiency requirement.

## FOUR YEAR PLAN

Below is a suggested pathway for new majors. This plan is an example only; students should discuss their graduation plan with their advisor.

## Geology, B.S.

### Freshman

Fall	Credits	Spring	Credits
GEOL 112		1 GEOL 113	1
GEOL 100 or 101		3 GEOL 102	3
GEOL 100L		1 GEOL 102L	1
CHEM 177		4 CHEM 178	3
CHEM 177L		1 CHEM 178L	1
ENGL 150		3 MATH 165	4
Social Science Choice		3 Arts & Humanities Choice	3
<b>16</b>		<b>16</b>	

### Sophomore

Fall	Credits	Spring	Credits
GEOL 315		3 GEOL 365	3
GEOL 315L		1 PHYS 131	4
GEOL 316		1 PHYS 131L	1
MATH 166		4 Advanced Geology Elective Choice	3
ENGL 250		3 LAS 203	1
LIB 160		1 U.S. Diversity Choice	3
International Perspectives Choice		3	
<b>16</b>		<b>15</b>	

### Junior

Fall	Credits	Spring	Credits	Summer	Credits
GEOL 368		4 GEOL 356		4 GEOL 302	6
GEOL 357		1 Advanced Geology Elective Choice <sup>1</sup>	3		
PHYS 132		4 ENGL 309 or 314	3		
PHYS 132L		1 Social Science Choice	3		

Advanced Geology Elective Choice <sup>1</sup>	3		
Arts & Humanities Choice	3		
<b>16</b>		<b>13</b>	
<b>6</b>		<b>6</b>	

### Senior

Fall	Credits	Spring	Credits
GEOL 479		3 Advanced Geology Elective Choice <sup>1</sup>	3
Advanced Geology Elective Choice <sup>1</sup>	3	3 Social Science Choice (300+ level)	3
Arts & Humanities Choice (300+ level)	3	3 Arts & Humanities Choice	3
World Language 101 Choice	4	4 World Language 102 Choice/ Elective	4
<b>13</b>		<b>13</b>	

**Total Credits: 124**

<sup>1</sup> Choose from list of approved courses available from an advisor or the departmental office.

Students may double-count some courses to complete the degree requirements in 120 credits.

## Minor - Geology

A minor in Geology may be earned by taking 15 credits of geology coursework, including:

GEOL 100 or GEOL 201 or GEOL 101	How the Earth Works Geology for Engineers and Environmental Scientists Environmental Geology: Earth in Crisis	3
GEOL 100L	How the Earth Works: Laboratory	1
GEOL 102	History of the Earth	3
GEOL 102L	History of the Earth: Laboratory	1

Although many students will take GEOL 100 as the first course in this sequence, GEOL 101 or GEOL 201 may be taken in place of GEOL 100. Note: all students must take GEOL 100L (How the Earth Works: Laboratory). The remainder of the coursework should be at the 300 level or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Concurrent Undergraduate and Graduate Programs

A concurrent program is offered which combines a bachelor of science degree in geology and a master of science degree in geology. This program gives well-qualified Iowa State juniors and seniors the opportunity to begin working on the M.S. degree before completing the B.S. degree, reducing by at least one year the normal time period necessary to complete both degrees separately. Additionally, a concurrent program exists that gives highly motivated and career-focused students the opportunity to receive a bachelor of science in geology and an M.B.A. (master of business administration). Review the department website (<https://ge-at.iastate.edu/>) or contact Dr. Cinzia Cervato for more information regarding these programs

## Graduate Study

The department offers programs leading to the master of science and doctor of philosophy with majors in Geology, Earth Science, and Meteorology. Students desiring a major in the above fields normally will have a strong undergraduate background in the physical and mathematical sciences. Individuals desiring to enter a graduate program are evaluated by considering their undergraduate preparation and performance along with their expressed goals in the statement of purpose. All prospective students should reach out to individual faculty members who they wish to work with prior to applying.

Programs of study are designed on an individual basis in accordance with requirements of the Graduate College and established requirements for each departmental major. Additional coursework is normally taken in complementary areas such as aerospace engineering, agronomy (soil science), chemistry, civil and construction engineering, computer engineering, computer science, engineering mechanics, environmental science, materials engineering, mathematics, mechanical engineering, microbiology, physics, or statistics. Departmental requirements provide a strong, broad background in the major and allow considerable flexibility in the program of each individual.

A dissertation is required of all Ph.D. candidates.

M.S. students in Geology are required to complete a thesis. The M.S. in Earth Science is available to students electing the non-thesis (Creative Component) option in Geology or Meteorology.

Graduates in Geology specialize in a subdiscipline, but they comprehend and can communicate the basic principles of geology and supporting sciences. They possess the capacity for critical and independent thinking. They are able to write a fundable research proposal, evaluate current relevant literature, carry out the proposed research, and communicate the results of their research to peers at national meetings and to the general public. They work as consultants on engineering and environmental problems, explorers for new minerals and hydrocarbon resources, researchers, teachers, writers, editors, and museum curators.

## History Overview

The History department offers Bachelor of Arts and Bachelor of Science degrees in History, a Master of Arts degree in History, and a Ph.D. in Rural, Agricultural, Technological and Environmental History. Many history majors also pursue a minor in another discipline, a second major, or secondary teacher certification.

The department offers a variety of survey courses (200 series) for first- and second-year students as either general education courses or as introductions to advanced courses in history or other subject areas. In addition to 200-level survey courses, it offers advanced undergraduate courses in the history of Europe, Asia, Africa, Latin America, the United States, technology and science, agriculture, and other selected topics.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Display the appropriate level of cognitive knowledge of historical themes and events based upon the student's course of study
2. Display an understanding of past cultures and social organizations, based on the course of study
3. Develop the fundamental methodological skills of the historical craft: the ability to contextualize and analyze primary source evidence; familiarity with the concepts of historical argument and interpretation, and the ability to formulate effective argumentation in written and oral forms; awareness of the basic historiography in selected research area; and the ability to conduct research and to write a historical essay based upon primary and secondary source research. Students receive an introduction to these concepts in HIST 301 The Historian's Toolbox.
4. Display a sophisticated understanding of the relationship between past events and the present. For purposes of outcomes assessment, History majors must complete three credits from the following list: HIST 495 Historiography and Research Writing; if qualified and willing, one graduate-level research seminar; or if qualified and pursuing teacher certification HIST 498 Methods of Teaching History/Social Sciences.

## Requirements for the History Major

The B.S. in History requires a minimum 36 total credits of HIST with 2.0 GPA or higher *including*:

1. Maximum 12 credits at 200-level HIST or below
2. Minimum 24 credits 300+ level HIST *including*:
3. HIST 301 (minimum grade C)
4. HIST 495, EDUC 498, or HIST graduate-level research seminar (minimum grade C)
5. Maximum 12 credits 300-level HIST in addition to HIST 301
6. Minimum 9 credits 400-level HIST in addition to HIST 495, EDUC 498 or HIST graduate-level research seminar
7. Minimum 15 credits 300+ level HIST taken at Iowa State University

Communication Proficiency requirement: History majors must receive a grade of C or better in ENGL 250 (or ENGL 250H), HIST 301 and HIST 495 or HIST 498.

The B.A. in History requires the equivalent of 2 years of college-level study in the same world language. Six credits of electives may be replaced by 6 additional credits of world language.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. For a history major, 15 credits of history at the 300/400 level must be taken at ISU. You must also complete the LAS world language and career proficiency requirements (LAS 203 Professional Career Preparation).

As majors in the College of Liberal Arts and Sciences, History students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated for the major.

### Teacher Preparation Focus

History majors seeking teacher certification in History/Social Sciences Education must meet all of the requirements of the History major while taking the specific History classes required for certification by the State of Iowa. Students must also meet the requirements of the Secondary Major in Education including PSYCH 230 and student teaching (EDUC 417). Students will complete the requirements below, earning a minimum grade of B- in all content courses used for licensure and a minimum grade of C in all other required courses.

Also, students complete the requirements for one additional fifteen-credit endorsement in Political Science, Psychology, Economics,

Anthropology or Sociology. Specific requirements of each endorsement are available from the history department. Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

Requirements to complete endorsements in American History and World History.

HIST 201	Introduction to Western Civilization I	3
HIST 202	Introduction to Western Civilization II	3
One World History pre-1500		3
HIST 304	Cultural Heritage of the Ancient World	
or HIST 331	History of the Islamic World to 1800	
or HIST 374	Sex, Gender, and Culture in the Ancient Mediterranean World	
or HIST 384	Roman Italy: An Introduction	
or HIST 385	Study Abroad: Roman Italy: Building the Empire	
or HIST 402	Greek Civilization	
or HIST 403	Roman Civilization	
or HIST 405	Transformations of the Early Medieval World	
or HIST 406	The Birth of Europe in the High Middle Ages	
or HIST 407	Crises of the Late Middle Ages	
or HIST 421	History of Russia I	
One European World post-1500		3
HIST 318	History of Early Modern Europe, 1450-1789	
or HIST 320	History of Modern Europe, 1789 to Present	
or HIST 325	Society and Politics in England, 1525-1700	
or HIST 382	History and Philosophy of the Scientific Revolution	
or HIST 383	Technology, Public Science, and European Culture, 1715-Present	
or HIST 390	World Military History	
or HIST 410	The Holocaust in History	
or HIST 414	European Cultural and Intellectual History	
or HIST 419	History of Modern France	
or HIST 420	France's Revolutionary Century, 1715-1815	
or HIST 422	History of Russia II	
or HIST 423	The Russian and Soviet Mind: Intellectual and Cultural Life, 1762-1991	
or HIST 424	History of Modern Germany	
or HIST 427	Crime and Policing in England 1550-1850	
or HIST 428	Punishment, Mentalities, and Society in England, 1550-1868	
or HIST 429	"Monstrous London": London's Histories 1500-1800	

or HIST 431 Modern England	
or HIST 489 The World at War	
One Non-European World post-1500	3
HIST 311 Africa under Colonial Rule	
or HIST 310 Africa to 1880	
or HIST 331 History of the Islamic World to 1800	
or HIST 336 History of Modern China I	
or HIST 337 History of Modern China II	
or HIST 339 US-Asian Relations	
or HIST 340 History of Latin America I	
or HIST 341 History of Latin America II	
or HIST 435 History of the Modern Middle East	
or HIST 441 History of Modern Mexico and Central America	
or HIST 442 Rebellions and Revolutions in Latin America	
or HIST 479 China and the Cold War	
or HIST 496CAAdvanced Topics in History: Global	
HIST 221 Survey of United States History I	3
HIST 222 Survey of United States History II	3
Nine additional credits of U.S. History at the 300 level and above	9
HIST 307 American Popular Culture	
or HIST 339 US-Asian Relations	
or HIST 353 History of African Americans I	
or HIST 354 History of African Americans II	
or HIST 357 American Family History	
or HIST 363 U. S. Environmental History	
or HIST 365 American Agriculture I: The Maya to McCormick's Reaper	
or HIST 366 American Agriculture II: Homestead Act to GMOs	
or HIST 367 America Eats	
or HIST 370 History of Iowa	
or HIST 371 Mexican American History	
or HIST 372 Latina/o History	
or HIST 380 History of Women in Science, Technology, and Medicine	
or HIST 386 History of Women in America	
or HIST 387 First Ladies in U.S. History	
or HIST 389 American Military History	
or HIST 391 American Diplomatic History	
or HIST 396BTTopics in History: U.S. and North America	
or HIST 449 US Gilded Age, 1877-1900	
or HIST 450 Colonial America	
or HIST 451 American Revolutionary Era	

or HIST 453 Law and Society in U.S. History: Crime, Race, Family, Work and Property	
or HIST 454 Early American Republic	
or HIST 455 U.S. Civil War and Reconstruction Era	
or HIST 457 History of American Sexualities	
or HIST 458 U.S. 1900 to 1945	
or HIST 459 U.S. 1945 to the Present	
or HIST 460 The Great Plains	
or HIST 461 The American South	
or HIST 465 The American West	
or HIST 468 History of Rural America	
or HIST 473 Civil Rights and Ethnic Power	
or HIST 482 Birth, Death, Medicine, and Disease	
or HIST 488 American Stuff, Colonial Times to the Present	
or HIST 489 The World at War	
or HIST 496BAAdvanced Topics in History: U.S. and North America	
HIST 301 The Historian's Toolbox	3
EDUC 426 Principles of Secondary Education	3
EDUC/HIST 498 Methods of Teaching History/Social Sciences	3
Total Credits	39

Four Year Plans  
History, B.S.

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 History Choice - 200 Level	3
History Choice - 200 Level	3 Natural Science Choice	3
Social Science Choice	3 Humanities Choice	3
Humanities Choice	3 Math Choice	3
Natural Science Choice	3 Social Science Choice	3
	LIB 160	1
	15	16
Sophomore		
Fall	Credits Spring	Credits
ENGL 250	3 HIST 301	3
History Choice - 200-300 Level	3 History Choice - 200/300 Level	3
World Language/Elective	3-4 World Language/Elective	4
Humanities Choice	3 Natural Science Choice	2
Social Science Choice	3 Elective	3
LAS 203	1	
	16-17	15

<b>Junior</b>			History Choice - 300/400 Level	3 History Choice - 400 Level	3
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>	Intermediate World Language - 200 Level	4 Intermediate World Language - 200 Level	4
History Choice - 300/400 Level	3 History Choice - 300/400 Level	3	Electives	5 Electives	4
History Choice - 300/400 Level	3 History Choice - 400 Level	3		<b>15</b>	<b>14</b>
Elective	9 Elective	8	<b>Senior</b>		
	<b>15</b>	<b>14</b>	<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
<b>Senior</b>			History Choice - 400 Level	3 HIST 495	3
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>	History Choice - 400 Level	3 Electives	12
History Choice - 400 Level	3 HIST 495	3	Electives	9	
History Choice - 400 Level	3 Elective	11		<b>15</b>	<b>15</b>
Elective	9		<b>Total Credits: 120</b>		
	<b>15</b>	<b>14</b>			

**Total Credits: 120-121**

## History, B.A.

### Freshman

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 150	3 History Choice - 200 Level	3
History Choice - 200 Level	3 Math Choice	3
Humanities Choice	3 Humanities Choice	3
Natural Science Choice	3 Natural Science Choice	3
Social Science Choice	3 Social Science Choice	3
	LIB 160	1
	<b>15</b>	<b>16</b>

### Sophomore

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 250	3 HIST 301	3
History Choice - 200/300 Level	3 History Choice - 200/300 Level	3
Elementary World Language - 100 Level <sup>1</sup>	4 Social Science Choice	3
Humanities Choice	3 Elementary World Language - 100 Level <sup>1</sup>	4
Elective	1 Natural Science Choice	2
LAS 203	1	
	<b>15</b>	<b>15</b>

### Junior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
History Choice - 300/400 Level	3 History Choice - 300/400 Level	3

History Choice - 300/400 Level	3 History Choice - 400 Level	3
Intermediate World Language - 200 Level	4 Intermediate World Language - 200 Level	4
Electives	5 Electives	4
	<b>15</b>	<b>14</b>

### Senior

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
History Choice - 400 Level	3 HIST 495	3
History Choice - 400 Level	3 Electives	12
Electives	9	
	<b>15</b>	<b>15</b>

**Total Credits: 120**

<sup>1</sup> The BA in History requires the equivalent of 2 years of college-level study in the same world language. Six credits of electives may be replaced by 6 additional credits of world language.

## Minor

The department offers a minor in History, which may be earned with 15 credits in History courses, of which at least 9 must be in courses numbered 300 or above, excluding HIST 490 Independent Study. A minimum of 9 credits numbered 300 or above must be taken at Iowa State. The College of Liberal Arts and Sciences requires students to earn a C or higher in at least 6 of the required 300-level credits. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. A student may count a maximum of 3 hours of cross-listed courses originating in another teaching department toward the minor in History. The History minor is most frequently chosen by students majoring in Political Science, English, Journalism, Computer Science, and Business.

## Graduate Study

The History Department offers two graduate degrees: an M.A. in History and a Ph.D. in Rural, Agricultural, Technological and Environmental History.

Most history graduate courses are either readings seminars or research seminars. Readings seminars acquaint students with the historical literature of a field and prepare them for careers in teaching and research. Research seminars require students to conduct original historical research and to write research papers reporting the results.

The M.A. in history includes both thesis and non-thesis options. See the departmental website on the M.A. in History for a full discussion of the options and requirements. An M.A. in History serves as the basis for continued study in history, as well as preparation for careers in law,



education, business, and government service. Throughout world history human beings have depended on rural and agricultural communities as well as on the technologies developed and employed by these communities to sustain lives. Iowa State's Doctoral Program in Rural, Agricultural, Technological and Environmental History offers a scholarly community and learning environment dedicated to the close examination of pervasive and enduring questions about these basic aspects of human history. Such questions can best be answered through the multifaceted perspectives provided by rural, agricultural, technological, and environmental history. The result is a dynamic learning experience that leads to comparative and transnational analysis shaped by a broad range of methods drawn from the humanities and social/physical sciences. The Program's aim is to produce students who are excellent researchers and engaging teachers, capable of succeeding in a broad variety of professional positions, both inside and outside of academia.

The Ph.D. in Rural, Agricultural, Technological and Environmental History is designed for students who have completed an M.A. in history. Those who have not yet completed an M.A. will be expected to complete the degree while progressing toward the Ph.D. Thirty semester hours of graduate credit are required for the M.A. and 72 for the Ph.D. Students who continue beyond the M.A. are expected to pass preliminary examinations in four areas of specialization, complete a dissertation, and defend it orally in the Ph.D. final examination. See the departmental website on the program for a full description of requirements.

## International Studies

### Overview

*Interdepartmental Undergraduate Secondary Major and Minor, Administered by the College of Liberal Arts and Sciences*

Through a combination of coursework and study abroad, students who complete a secondary major or minor in International Studies can prepare for careers or advanced study in the international arena, such as foreign service, journalism, advocacy organizations, scientific or research institutions, business, nongovernmental development organizations (NGOs), humanitarian agencies, environmental organizations, human rights organizations, think tanks, international agriculture, and international engineering. Students in International Studies gain an understanding of global issues, learn to communicate across cultures, develop awareness of cultural ideas and attitudes, and are well positioned to become global leaders in their chosen field.

A secondary major and a minor in International Studies are available for undergraduates. The program requirements are structured around a combination of a designated Topical Module and a Geographic Region, both selected by the student. Each student's program of study is

designed to reflect opportunities at Iowa State University as well as the academic, intellectual, and professional interests of the student.

### Student Learning Outcomes

Upon completion of the second major in International Studies, students will be able to:

1. Read, write and speak a language other than their native language at an intermediate level to effectively communicate with people from other cultures.
2. Understand factual knowledge about world economic and political systems, events, cultures, and geography and to critically analyze global issues, especially as they relate to globalization.
3. Understand, interpret, and articulate the major processes, theories, and problems of a selected contemporary global issue within a selected world region to also recognize interconnections between local and global issues and events.
4. Live, study, work, and/or volunteer in a selected world region in order to understand, interpret and articulate major cultural values and issues and to appreciate the impact of one's own cultural and educational experience on their perception of the world.

### Secondary Major

A student seeking a secondary major in International Studies must successfully complete two core courses plus courses in a selected Geographic Region and Topical Module; demonstrate proficiency in a language relevant to the selected geographic region (see below); and participate in a required study, service, or work abroad program (see below).

*Requirements for the Secondary Major in International Studies:*

- INTST 235 Introduction to International Studies
- INTST 430 Seminar in International Studies
- 9 credits of coursework (at least 6 of which are numbered 300 or above) from one of the following Geographic Regions:
  - Africa and the Middle East
  - Asia
  - Latin America
  - Western Europe
  - Russia, East Europe and Central Asia
- 9 credits of coursework (at least 6 of which are numbered 300 or above) from one of the following Topical Modules:
  - Global Environmental Issues
  - Globalization and Economic Development
  - International Issues in Science and Technology

- International Communication
- International Conflict
- Social and Cultural Change

Click here (<https://iastate.box.com/shared/static/2egqdgik8da0qiipayf.pdf>) for courses approved for credit for the Geographic Regions and Topical Modules.

- 3 additional credits of coursework selected from either the Geographic Region or Topical Module.

## Language Proficiency

- Proficiency in a world language that is relevant to the selected geographic region. This can be achieved by completing the 202 level (or higher) of the language. Students whose first language is not English must still meet this requirement if their first language is not relevant to their selected geographic region.

## Study/Service/Work Abroad Experience

- Study, service, or internship abroad for a minimum of 3 weeks, earning a minimum of 3 credits. The credits must be transferable to Iowa State.

The major must include a minimum of 12 credits not used to meet any other department, college, or university requirement.

## Minor

A student seeking a minor in International Studies must successfully complete two core courses plus courses in a selected Geographical Region and Topical Module; demonstrate proficiency in a language relevant to the selected geographic region (see below); and participate in a required study, service, or work abroad program (see below).

*Requirements for the Minor in International Studies:*

- INTST 235 Introduction to International Studies
- INTST 430 Seminar in International Studies
- 6 credits of coursework (at least 3 of which are numbered 300 or above) from one of the following Geographic Regions:
  - Africa and the Middle East
  - Asia
  - Latin America
  - Western Europe
  - Russia, East Europe and Central Asia
- 6 credits of coursework (at least 3 of which are numbered 300 or above) from one of the following Topical Modules:
  - Global Environmental Issues
  - Globalization and Economic Development
  - International Issues in Science and Technology

- International Communication
- International Conflict
- Social and Cultural Change

- Proficiency in a world language that is relevant to the selected geographic region. This can be achieved by completing the 202 level (or higher) of the language.

- Study, service, or internship abroad for a minimum of 3 weeks, earning a minimum of 3 credits. The credits must be transferable Iowa State.

Click here (<https://iastate.box.com/shared/static/2egqdgik8da0qiipayf.pdf>) for courses approved for credit for the Geographic Regions and Topical Modules.

The minor must include a minimum of 9 credits not used to meet any other department, college, or university requirement.

## Language Proficiency

- Proficiency in a world language that is relevant to the selected geographic region. This can be achieved by completing the 202 level (or higher) of the language or by passing an approved exam. Students whose first language is not English must still meet this requirement if their first language is not relevant to their selected geographic region.

## Study/Service/Work Abroad Experience

- Study, service, or internship abroad for a minimum of 3 weeks, earning a minimum of 3 credits. The credits must be transferable to Iowa State.

# Journalism and Mass Communication

<http://www.greenlee.iastate.edu> (<http://www.greenlee.iastate.edu/>)

The journalism and mass communication major prepares students for careers that involve all aspects of news and information. Emphasis is placed on generating ideas, organizing, writing, editing, and presenting information for various media platforms and audiences. Students work with advisors to develop a program of study that prepares them for work in communication-specific areas including broadcast media, magazines and/or newspapers, photojournalism, science communication, visual communication, and digital media. Coursework in this major focuses on writing, research, digital and emerging media, and professional abilities. Students are required to complete a capstone internship experience to practice and refine their skills.

The Greenlee School of Journalism and Communication prepares students for the field of communication. The school offers three majors:

- Advertising Bachelor of Arts (ADVRT)
- Journalism and Mass Communication Bachelor of Science (JL MC)
- Public Relations Bachelor of Science (P R)

In addition, the Greenlee School offers a 4+1 program allowing students to complete their B.A. or B.S. and earn an M.S. in journalism and mass communication in fewer semesters.

Professional skills are taught and practiced alongside academic requirements using the latest technology and leading-edge communication trends and methods.

Founded in 1905, the unit was one of the first journalism programs to be accredited in 1948 and continues to be one of the longest continuously accredited programs in the country. Accreditation is based on the principle that students need a broad-based, liberal arts education and solid core courses within the discipline. Students taking one major at the school may not seek an additional major or a minor in the school. All students are required to take an additional major or a minor outside the school as an area of expertise.

Student Learning Outcomes

Students who major in programs of the Greenlee School of Journalism and Communication are expected to develop competencies in 10 key areas:

- apply the principles and laws of freedom of speech and press, in a global context, and for the country in which the institution that invites ACEJMC is located;
- demonstrate an understanding of the multicultural history and role of professionals and institutions in shaping communications;
- demonstrate culturally proficient communication that empowers those traditionally disenfranchised in society, especially as grounded in race, ethnicity, gender, sexual orientation and ability, domestically and globally, across communication and media contexts;
- present images and information effectively and creatively, using appropriate tools and technologies;
- write correctly and clearly in forms and styles appropriate for the communications professions, audiences and purposes they serve;
- demonstrate an understanding of professional ethical principles and work ethically in pursuit of truth, accuracy, fairness and diversity;
- apply critical thinking skills in conducting research and evaluating information by methods appropriate to the communications professions in which they work;
- effectively and correctly apply basic numerical and statistical concepts;
- critically evaluate their own work and that of others for accuracy and fairness, clarity, appropriate style and grammatical correctness;

- apply tools and technologies appropriate for the communications professions in which they work.

The Journalism and Mass Communication Major

To receive a bachelor of science degree in journalism and mass communication, a student must earn at least 120 credits. A minimum of 72 credits must come from courses other than ADVRT, JL MC or P R. At least 50 of these credits must come from the liberal arts and sciences. Overall, at least 45 credits must be from 300-level or above.

The degree requirements allow for a minimum of 34 credits and a maximum of 48 credits to be taken in ADVRT, JL MC and P R. These include:

JL MC 110	Orientation to Journalism and Communication	1
JL MC 240	Principles of Journalism	3
JL MC 201	Reporting and Writing for the Mass Media (C+ or better)	3
One of the following two courses with C+ or better:		
JL MC 302	Intermediate Reporting and Writing for the Mass Media	3
	or JL MC 303 Reporting and Writing for Broadcast Media	
300-level ADVRT, JL MC or P R Electives		9
JL MC 460	Law of Mass Communication	3
JL MC 462	Media Ethics, Freedom, Responsibility	3
400-level ADVRT, JL MC, or P R Electives		6
JL MC 499A	Professional Media Internship: Required	3
Total Credits		34

Journalism and mass communication majors are also required to take:

STAT 101	Principles of Statistics (or another approved statistics course)	4
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As majors in the College of Liberal Arts and Sciences, journalism and mass communication students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

University Requirement: Students in all ISU majors must complete a three-credit course in U.S. Diversity, as well as a three-credit course in International Perspectives. The approved course lists are found at the following web addresses:(U.S. Diversity) <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>) and (International Perspectives) <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current>)

ip-guide/IntlPerspectives-current/). Students must also demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

**College of LAS Requirement:** Minimum of 120 credits, including a minimum of 45 credits at the 300-level and above. You must also complete the LAS world language requirement, LAS career proficiency requirement, and any unmet ISU admission requirements.

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

**Minor or Additional Major:** Students are required to fulfill a secondary area of expertise. This requirement can be met by declaring a minor or an additional major outside of the Greenlee School of Journalism and Communication. Students taking one major at the school may not seek an additional major or a minor in the school.

Juniors can apply to a concurrent degree program and earn a B.S. and an M.S. in journalism and mass communication in fewer semesters. Contact the Director of Graduate Education for more information on the Greenlee School's 4+1 Program.

## Journalism and Mass Communication, B.S.

### Freshman

Fall	Credits	Spring	Credits
JL MC 110		1 JL MC 201	3
JL MC 240		3 STAT 101	4
ENGL 150		3 Social Science	3
Arts and Humanities		3 Natural Science	3
Natural Science		3 Arts and Humanities	3
LIB 160		1	
<b>14</b>		<b>16</b>	

### Sophomore

Fall	Credits	Spring	Credits
JL MC 300-level choice		3 JL MC 302 or 303	3
ENGL 250		3 U.S. Diversity	3
Social Science		3 World Language or Elective	4
World Language or Elective		3-4 Arts and Humanities	3

Natural Science	2	Social Science	3		
LAS 203	1				
15-16		16			
Junior					
Fall	Credits	Spring	Credits	Summer	Credits
JL MC 300-level choice		3 JL MC 300-level Choice		3 JL MC 499A	3
JL MC 400-level choice		3 Minor/Additional Major Choice		3	
International Perspective		3 Minor/Additional Major Choice 300+ Level		3	
Minor/Additional Major Choice		3 Minor/Additional Major Choice 300+ Level		3	
Minor/Additional Major Choice		3 Arts & Humanities		3	
15		15		3	

### Senior

Fall	Credits	Spring	Credits
JL MC 460		3 JL MC 462	3
JL MC 400-level Choice		3 Elective or Minor/Additional Major Choice 300+ Level	3
ADVRT/JL MC/P R Short Course Intensive Elective		1 Elective or Minor/Additional Major Choice 300+ Level	3

Elective	4 Elective	3
or Minor/	or Minor/	
Additional	Additional	
Major	Major	
Choice	Choice	
Minor/	3	
Additional		
Major		
Choice		
300+ Level		
	14	12

Total Credits: 120-121

## Minor in Journalism and Mass Communication

Students cannot select more than one minor in the Greenlee School of Journalism and Communication. Minors in the Greenlee School are not available to Greenlee majors.

For a minor in journalism and mass communication, students complete 15 credits. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

JL MC 101	Mass Media and Society	3
JL MC 240	Principles of Journalism	3
9 credits from the following:		9
JL MC 242	Visual Principles for Mass Communicators	
JL MC 307	Digital Video Production	
JL MC 347	Science Communication	
JL MC 390	Professional Skills Development	
JL MC 401	Mass Communication Theory	
JL MC 406	Media Management	
JL MC 461	History of American Journalism	
JL MC 464	Journalism and Literature	
JL MC 474	Communication Technology and Social Change	
JL MC 476	World Communication Systems	
JL MC 477	Diversity in the Media	
JL MC 497	Special Topics in Communication	

Total Credits 15

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

## Concurrent Undergraduate and Graduate Programs

The Greenlee School offers three concurrent degree programs:

- B.A. Advertising/M.S. Journalism and Mass Communication
- B.S. Journalism/M.S. Journalism and Mass Communication
- B.S. Public Relations/M.S. Journalism and Mass Communication

Enrollment in the Greenlee School's concurrent degree programs enables students to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees. Graduates of the concurrent degree program will be prepared to face today's rapidly changing media environment and contribute to society by becoming a leader within the communication field. Upon completion of the undergraduate program (bachelor's degree), students can choose between two tracks in the master's program (master's degree): one for students who desire specialized study in communication theory and research and one for students who wish to develop or strengthen their professional and strategic communication skills. At the master's level, the School is well known for developing practitioners and scholars in science communication, political communication, multicultural communication and media industries. The ISU Graduate Handbook outlines policies and requirements for concurrent degree programs. Concurrent degree students must complete all academic requirements and required coursework for both degrees.

To be eligible for a concurrent degree program, currently enrolled Greenlee ADVRT, JL MC or P R students must 1) be defined as seniors by their number of cumulative ISU credits (90 credits or more) and 2) have successfully completed JL MC 201 (required of all three undergraduate majors) with a C+ or better. Before beginning graduate coursework, concurrent degree candidates must formally indicate their interest by contacting the Greenlee School's Director of Graduate Education. Interested students must then apply to the master's program no later than March 1 of the year prior to taking graduate coursework. Application and admissions requirements for the master's program (<https://greenlee.iastate.edu/graduate/graduate-admissions/>) are the same for concurrent students as those applying to the master's program after completing an undergraduate degree. A thesis or creative component is required for all concurrent degree students.

To receive a bachelor of science/arts degree from the Greenlee School in advertising, journalism or public relations, a student must earn at least 120 credits and complete all required courses. To receive a master's of science degree from the Greenlee School in journalism and mass communication, a student must earn at least 32 credits and complete all required courses.

Preference for assistantships will be given to students who have completed all of their undergraduate coursework.

## Student Learning Outcomes

1. To develop an understanding of the central issues and current research important to the field of journalism and communication.
2. To be familiar with the breadth and depth of the journalism and communication profession.
3. To be able to communicate acquired knowledge in the field.
4. To be aware of ethical issues that pertain to the field of journalism and communication.
5. To develop the ability to design and present an independent and meaningful research project.

## Graduate Programs

### Master of Science

The Greenlee School of Journalism and Communication offers work for a master of science degree in journalism and mass communication.

#### Majors plan a program of study in one of two tracks:

I. Academic track – The School offers advanced academic preparation in communication theory and research, leading to the master of science degree. Graduate work prepares students to use and contribute to research and scholarship in the field of communication. This track requires a thesis based on original research, which must be defended successfully before a committee at the end of the program.

Areas of research emphasis include: science and risk communication, media effects, advertising, public relations, political communication, communication technology, law and ethics, international communication, visual communication and emerging media.

II. Professional track – The School offers advanced professional study in journalism and mass communication leading to the master of science degree. Graduate work prepares students for professional careers in a variety of mass communication fields. Students with limited training or experience in journalism and mass communication may include skills courses in their programs, but the credits for those courses may not count toward the graduate degree. This track requires either a creative component which must be defended successfully before a committee at the end of the program.

All graduate students must complete 32 credits for graduation, comprised of four core classes, at least two electives outside the Greenlee School, and at least four thesis or creative component credits. The following core courses account for 10 credits of the needed 32 credits.

JL MC 501	Theories of Mass Communication	3
JL MC 502	Fundamentals of Communication Research Methods	3

JL MC 592	Introduction to Graduate Study in Journalism and Mass Communication	1
JL MC 598	Seminars in Mass Communication	1-3

Each student selects elective courses based on his/her area of emphasis and career goal, in consultation with the student's major professor and Program of Study Committee.

## Student Learning Outcomes

1. To develop an understanding of the central issues and current research important to the field of journalism and communication.
2. To be familiar with the breadth and depth of the journalism and communication profession.
3. To be able to communicate acquired knowledge in the field.
4. To be aware of ethical issues that pertain to the field of journalism and communication.
5. To develop the ability to design and present an independent and meaningful research project.

## Graduate Minor

The Greenlee School graduate program offers minor work for students majoring in other departments. The M.S. minor requires:

JL MC 501, JL MC 510 and one other course in journalism and mass communication for a total of 9 credits taken within the Greenlee School.

## Concurrent Programs

The Greenlee School's concurrent degree programs enable interested students the opportunity to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees.

## Latin American Studies Certificate Interdepartmental Undergraduate Program

The certificate in Latin American Studies is a cross-disciplinary course of study in the College of Liberal Arts and Sciences and is designed for undergraduates in any major who wish to enhance their degree and employment possibilities by adding expertise in Latin America and competence in the Spanish language.

## Objectives

- Provide opportunities for students to develop skills and understanding about issues concerning Latin America by bringing them into contact with faculty members from many different academic backgrounds
- Provide students with an international immersion experience where they gain cultural awareness and sensitivity



- Prepare students for work or advanced study in Latin America, such as in foreign service, journalism, advocacy organizations, scientific or research institutions
- Help students acquire proficiency in one of the principal languages of Latin America (Spanish)
- Guide students in interdisciplinary study leading to an understanding of the multi-faceted picture of the past, present, and future of Latin America

Learning Outcomes

Upon Completion of the Certificate in Latin American Studies, students will be able to:

- Demonstrate understanding of key concepts pertaining to Latin American cultural, historical and political events
- Understand, interpret and articulate the major processes, theories and problems of selected contemporary and historical issues in Latin America
- Demonstrate oral, aural, and written proficiency in Spanish equivalent to the mid-advanced level
- Effectively communicate with persons of Latin American cultures
- Become effective global citizens through knowledge and comparison of the cultures and issues of the United States and Latin American countries
- Be able to read Latin American cultural, literary, and historical texts in the target language with comprehension and analytical insight
- Demonstrate awareness of cultural values, beliefs, and ideologies of the various Latin American countries
- Demonstrate a thorough knowledge of the geography of the Latin American countries

General Requirements

Requirements for the Certificate in Latin American Studies are satisfied through formal language instruction and by completing a minimum of 21 credits at the 300 level or above. Students will take coursework in at least three different disciplines and departments (Spanish, Anthropology, and Political Science) with other possible course offerings in LAS, History, Agriculture, and Agronomy.

Course Requirements

Students will complete 6 credits of core courses:

SPAN 322	Latin American Civilization	3
or SPAN 324	Latin America Today	
ANTHR 323	Topics in Latin American Anthropology	3

Students should consult with their advisor for alternative courses in the event a course is not available.

Other Requirements

Students will complete an additional 15 credits selected from the approved list of courses in Latin American Studies or courses approved by the Latin American Studies Certificate advisor at the 300 level or above.

- No more than 3 credits may be taken as a 490, independent study, and the topic must deal with Latin America.
- A minimum of 9 credits applied toward the Certificate cannot be used to meet any other departmental, college, or university requirement.
- Students may receive credit on a pre-approved basis for internships completed in Latin America. No more than 3 credits from this area may be applied to the Certificate.
- Courses taken for the Certificate may not be taken on a pass not-pass basis.
- Credits for a Certificate may be used to satisfy the credit requirement for graduation and to meet the credit requirements for courses numbered 300 and above.
- A certificate is not awarded if the baccalaureate degree is not finished.
- For students earning an ISU baccalaureate degree, a certificate is awarded concurrent with or after the ISU baccalaureate degree.
- After receiving a baccalaureate degree from any accredited institution, a student may enroll at ISU to earn a certificate.
- A cumulative grade point average of at least 2.00 is required in courses taken at ISU for a certificate.

LANGUAGE REQUIREMENT

- The minimum requirement in formal language instruction is completion of two years or the equivalent of Spanish at the university level. At ISU the completion of Spanish 202 satisfies this requirement.
- Native speakers, or those with in-field experience of another Latin American language with a level equivalent to 202 or higher can have the language requirement waived. Equivalence will normally be assessed by a faculty member/CLEP exam in the Dept. of World Languages and Cultures.
- While students are encouraged to enroll in language instruction courses (i.e., conversation and composition) above the 300 level, no more than 6 credits of language study (301,303, 304) may be applied toward fulfilling language requirements for the Certificate. Students should be aware that all 300-level literature and culture/civilization courses in the Dept. of World Languages and Cultures have prerequisites.

Study Abroad

Students are required to participate in an ISU-approved study abroad program in a Latin American country with a minimum duration of 4 consecutive weeks. The Study Abroad Office has a list of ISU-approved

programs. Students may elect to participate in other study abroad programs with the approval of the Latin American Studies Advisory Committee.

### Approved courses available toward the Certificate:

The decision as to whether or not a course can be counted toward the certificate is based primarily on course title and description as it appears in the current ISU course catalog. Courses which primarily deal with Spain or Portugal and their cultures do not count toward the certificate. Students should consult with the advisor for the Latin American Studies Undergraduate Certificate program before registering to be sure a particular travel course or field school offering can apply toward the certificate.

AGEDS 496	Agricultural Travel Course	1-3
AGRON 496	Agricultural Travel Course	arr†
ANTHR 323	Topics in Latin American Anthropology	3
ANTHR 445	Biological Field School	4-6
or ANTHR 545	Biological Field School	
HIST 340	History of Latin America I	3
HIST 341	History of Latin America II	3
INTST 395	Interdisciplinary Study Abroad	1-4
POL S 343	Latin American Government and Politics	3
SPAN 322	Latin American Civilization	3
SPAN 324	Latin America Today	3
SPAN 326	Studies in Hispanic Art or Film	3
SPAN 332	Studies in Latin American Literature	3
SPAN 370	Hispanic Topics in English Translation	3
SPAN 395	Study Abroad	1-10
SPAN 445	Seminar on the Literatures and Cultures of Latin America	3
SPAN 463	Contemporary Spanish Linguistics	3
SPAN 499	Internship in Spanish	1-3

† Arranged with instructor.

## Leadership Studies

### Overview

The Leadership Studies Program provides a strong foundation of coursework and experiences for undergraduate students who seek to study, understand and apply the principles of leadership in their current activities and, eventually, in their careers. This interdisciplinary program, designed for students in all majors, consists of a 21-credit-hour leadership studies certificate, a 15-credit leadership studies minor, and a suite of leadership studies courses. Students earning either the certificate or minor in leadership studies will develop the

knowledge and skills to effect positive change as they enter the public, nonprofit or private sectors. The certificate and minor are awarded by the College of Liberal Arts and Sciences and noted on the student's transcript. To learn more about the program, visit our website: <https://leadership.las.iastate.edu/>.

### Objectives

- Develop students' leadership capacity—which encompasses individual-level capabilities of self-awareness, integrity and commitment; group-level capabilities of collaboration, shared purpose and handling controversy with civility; and community-level capabilities of citizenship and civic responsibility.
- Provide opportunities for students to study leadership by learning effective communication practices, organizational theories, ethical principles, an appreciation of diversity, intrapersonal development and the value of community service.
- Cultivate students' understanding of social empowerment and social justice to create positive and sustainable change.
- Challenge students to critically examine leadership at the intrapersonal, interpersonal, team, organizational and societal levels.
- Bring students into contact with community leaders and faculty members from diverse academic departments, backgrounds and leadership experiences.
- Prepare students to undertake leadership roles in their careers and in service to their community through coursework and co-curricular engagement.

### Learning Outcomes

Upon completion of the certificate or minor in leadership studies, students will be able to:

- Recognize leadership as a set of skills, knowledge and attitudes that can be learned.
- Understand traditional and emergent leadership theories and apply them in practice.
- Comprehend key concepts of communication theories, organizational theories, contemporary diversity issues and ethical principles.
- Practice and evaluate their own capacity to lead effectively within teams, organizations and diverse communities.
- Develop and implement plans for continually improving their leadership capacity.
- Demonstrate proficiencies in written and oral communication.

## Leadership Studies Minor

The minor in leadership studies requires the completion of 15 credit hours through three 3-credit-hour required courses in leadership and organizational theory, and an additional 6 credit hours earned from approved leadership electives.

At least 9 credits must be taken in courses numbered at the 300-level or above. At least 9 credits used for the minor cannot be used to meet any other department, college or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above. Courses for the minor cannot be taken on a pass/not-pass basis. A cumulative grade point average of at least 2.0 is required in courses taken for the minor.

**Core Courses:** 9 required credits

LD ST 301	Leadership Theory and Practice	3
LD ST 322	Leadership in a Diverse Society	3
MGMT 372	Ethical and Responsible Management	3
or MGMT 422	Negotiation and Conflict Resolution	

**Leadership Electives:** Choose 6 credits from the following

AESHM 211	Leadership Experiences and Development (LEAD)	3
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
COMST 218	Conflict Management	3
COMST 313	Leadership Communication Theories	3
ENGR 150	Foundations of Leadership Development and Learning	1
ENGR 250	Leadership in Engineering Teams	1
ENGR 350	Dean's Leadership Seminar	1
LD ST 122	Leading with Purpose	1
LD ST 270	Campus Leadership Development	3
LD ST 291	Leading Change	4
LD ST 291A	Leading Change: General	4
LD ST 291B	Leading Change: U.S. Diversity	4
LD ST 291C	Leading Change: International Perspectives	4
LD ST 293	Special Projects	3
LD ST/WGS 333	Women, Gender, and Leadership	3
LD ST 370	Special Topics	1-3
LD ST 422	Leadership Capstone Seminar: Theory to Practice	3
LD ST 488	Research on Gender and Leadership	3
M E 412	Ethical Responsibilities of a Practicing Engineer	3
MGMT 372	Ethical and Responsible Management	3
MGMT 422	Negotiation and Conflict Resolution	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
PHIL 235	Ethical Issues in a Diverse Society	3
SP CM 312	Business and Professional Speaking	3

## Leadership Studies Certificate

The certificate in leadership studies requires the completion of 21 credit hours including the 9 credit leadership studies core. An additional 12 credit hours are earned from approved electives including 3 hours in communication, 6 hours in leadership, and 3 hours of a capstone experience through a course, internship or study abroad. The capstone course should focus on the scholarship of leadership in the student's field of study, whereas an internship or a study abroad should provide a leadership-in-practice experience.

At least 9 credits must be taken in courses numbered at the 300-level or above. At least 9 credits used for the certificate cannot be used to meet any other department, college or university requirement for the baccalaureate degree except to satisfy the total credit requirement for graduation and to meet credit requirements in courses numbered 300 or above. Courses for the certificate cannot be taken on a pass/not-pass basis. A cumulative grade point average of at least 2.0 is required in courses taken for the certificate.

**Core Courses:**

9 credits of required core courses

LD ST 301	Leadership Theory and Practice	3
LD ST 322	Leadership in a Diverse Society	3
MGMT 372	Ethical and Responsible Management	3
or MGMT 422	Negotiation and Conflict Resolution	

**Communication Electives:**

Choose 3 credits from the following

COMST 214	Professional Communication	3
COMST 310	Intercultural Communication	3
COMST 314	Organizational Communication	3
ENGL 302	Business Communication	3
SP CM 212	Fundamentals of Public Speaking	3
SP CM 312	Business and Professional Speaking	3
SP CM/WGS 323	Gender and Communication	3

**Leadership Electives:**

Choose 6 credits from the following

AESHM 211	Leadership Experiences and Development (LEAD)	3
AESHM 222	Creativity on Demand	3
AESHM 287	Principles of Management in Human Sciences	3
AESHM 421	Developing Global Leadership: Maximizing Human Potential	3
AESHM 474	Entrepreneurship in Human Sciences	3

AGEDS 315	Personal, Professional, and Entrepreneurial Leadership in Agriculture	3
C E 306	Project Management for Civil Engineers	3
COMST 218	Conflict Management	3
COMST 313	Leadership Communication Theories	3
COMST 317	Small Group Communication	3
C R P 429	Planning in Developing Countries	3
C R P 432	Community Planning Studio	4-6
C R P 435	Planning in Small Towns	3
C R P 492	Planning Law, Administration and Implementation	3
CON E 380	Engineering Law	3
ENGR 150	Foundations of Leadership Development and Learning	1
ENGR 250	Leadership in Engineering Teams	1
ENGR 350	Dean's Leadership Seminar	1
HD FS 395	Children, Families, and Public Policy	3
LAS 151	Dean's Leadership Seminar I	1
LD ST 122	Leading with Purpose	1
LD ST 270	Campus Leadership Development	3
LD ST 290	Independent Study	1-3
LD ST 291	Leading Change	4
LD ST 291A	Leading Change: General	4
LD ST 291B	Leading Change: U.S. Diversity	4
LD ST 291C	Leading Change: International Perspectives	4
LD ST 293	Special Projects	1-3
LD ST/WGS 333	Women, Gender, and Leadership	3
LD ST 370	Special Topics	1-3
LD ST 422	Leadership Capstone Seminar: Theory to Practice	3
LD ST/WGS 488	Research on Gender and Leadership	3
LD ST 490	Independent Study	1-3
M E 412	Ethical Responsibilities of a Practicing Engineer	3
MGMT 372	Ethical and Responsible Management	3
MGMT 422	Negotiation and Conflict Resolution	3
MGMT 472	Diversity, Equity, and Inclusion in Organizations	3
N S 412	Leadership and Ethics	3
PHIL 235	Ethical Issues in a Diverse Society	3
POL S 310	State and Local Government	3
POL S 271	Public Organizations and Leadership	3
POL S/WGS 385	Women in Politics	3
POL S 475	Management in the Public Sector	3
POL S 487	Electronic Democracy	3
SOC 310	Community	3
SOC/POL S 334	Politics and Society	3

SP CM 110	Listening	3
SP CM/POL S 417	Campaign Rhetoric	3
U ST 315	Cyclone Aide Leaders Seminar	2
WGS 301	International Perspectives on Women and Gender	3
WGS 435	Gender, Globalization and Development	3

## Capstone Courses:

Choose 3 credits of the following

LD ST 422	Leadership Capstone Seminar: Theory to Practice	3
LD ST 490	Independent Study (Must include a leadership focus and be pre-approved by the leadership studies faculty.)	1-3

Study abroad: Must include a leadership focus and be pre-approved by the leadership studies faculty.

Other capstones may be approved with leadership studies faculty permission if they include a significant leadership component (e.g., COMST 404 or AESHM 421 with a leadership-based project). Students wishing to take a capstone course not listed here must receive approval prior to registering for the course and must demonstrate in writing how the course includes a significant leadership component.

## Bachelor of Liberal Studies

### Bachelor of Liberal Studies Degree

The Bachelor of Liberal Studies degree (B.L.S.) is a general studies degree in the liberal arts. It was established by the three Iowa Regent universities primarily to meet the needs of Iowans who want to earn a college degree but whose circumstances present obstacles to completing a traditional on-campus degree program. While the B.L.S. does not have traditional majors focused on a specific discipline and students have more flexibility in choosing courses that apply to their program, the requirements for the degree are as rigorous as requirements for other degree programs offered by Iowa State University. With the assistance of a B.L.S. advisor, students can structure a program that meets their individual educational, vocational or personal goals.

The B.L.S. degree is a transfer-friendly degree. Work done in community colleges or other accredited colleges and universities can be applied toward the degree and can often meet requirements for one of the B.L.S. majors. Up to three-fourths of the total degree requirements can be transferred from accredited institutions. Students with military or professional and technical credits with outcomes contributing to the learning outcomes of the distribution areas of either major are encouraged to submit coursework for review to potentially apply such credits to the major. The B.L.S. degree has no residence requirements,

but students are expected to have 30 credits from ISU earned during the junior and/or senior year.

Students can earn the Bachelor of Liberal Studies Degree by choosing to major in either Liberal Studies or Professional Studies.

Admission

Admission to the B.L.S. program is open to persons who have at least 24 semester credits of collegiate work acceptable toward graduation at ISU with a total cumulative grade point average of at least 2.00 (a C average).

Student Learning Outcomes of the Liberal Studies Major

In addition to meeting the learning goals of the general education program of the College of Liberal Arts and Sciences and meeting University wide learning goals, Liberal Studies graduates should be able to:

- Use appropriate learning strategies to gain new knowledge.
- Integrate knowledge and modes of thinking from multiple disciplines.
- Apply their knowledge to evaluate issues and solve problems.
- Connect their learning to their professional goals.

Student Learning Outcomes of the Professional Studies Major

In addition to meeting the learning goals of the general education program of the College of Liberal Arts and Sciences and meeting University-wide learning goals, Professional Studies graduates should be able to:

- Apply their knowledge to evaluate issues and solve problems.
- Express thoughts and ideas clearly and effectively.
- Demonstrate awareness of the strengths of others and build collaborative relationships with diverse team members to achieve common goals.
- Demonstrate ability to select and use appropriate technology in order to accomplish a given task.
- Connect their learning to their professional goals.

Requirements for the B.L.S. Degree With a Major in Liberal Studies

All students seeking a B.L.S. degree must meet the University-wide requirements (<https://catalog.iastate.edu/collegescurricula/>) for graduation, including earning a total of 120 credits. The Liberal Studies major requires 36 credits of coursework across three of five areas of distribution according to the requirements laid out below. Students determine which distribution areas to emphasize in their degree program through consultation with their Bachelor of Liberal Studies academic advisor.

Liberal Studies students must also meet the General Education, World Languages/Cultures and Career Proficiency Requirements of the College of Liberal Arts and Sciences and earn a minimum of 39 credits at the 300/400 level. Courses taken at Iowa State University on a pass/not pass basis may be counted toward graduation only as electives.

University-wide Requirements

Communication Proficiency: Foundation Courses		6
ENGL 150	Critical Thinking and Communication	
ENGL 250	Written, Oral, Visual, and Electronic Composition (with a grade of C or better)	
or equivalent of ENGL 150, ENGL 250		
Communication Proficiency: Upper-level curricula (grade C- or better)		3
ENGL 302	Business Communication	
	or ENGL 305 Creative Writing: Nonfiction	
	or ENGL 309 Proposal and Report Writing	
	or ENGL 314 Technical Communication	
or comparable extensive writing experience		
International Perspectives*		3
U.S. Diversity*		3

\*Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how these courses can apply to your graduation plan.

LAS General Education, World Languages/Cultures, and Career Proficiency Requirements

Arts and humanities*		12
Mathematics, statistics, or computer science*		3
Natural sciences*		8
Social sciences*		9
World languages/Cultures**		3-8
LAS 203	Professional Career Preparation	1

\*A list of courses acceptable in the general education groups can be obtained from the college website (<http://www.las.iastate.edu/students/academics/general-education/>).

\*\*The requirement may be met by completion of three or more years of high school study in one world language; by meeting the LAS World Language requirement; or by taking six credits from the list of International Perspectives courses, three credits of which cannot be used to satisfy another degree requirement.



## Distribution Requirements and Electives

A minimum of 12 credits is required in each of three of the five distribution areas listed below. Students determine which distribution areas to include in their degree program through consultation with their Bachelor of Liberal Studies academic advisor.

Distribution Areas (Three of five below, with a minimum of 6 credits at the 300 level or above in each of the three)

Humanities (for example, literature, philosophy, history, religion, art and music appreciation)

Communications and arts (for example, journalism, speech, writing, drama, art, world language, communication studies, advertising, public relations)

Natural sciences and computational disciplines (for example, chemistry, physics, biology, geological and atmospheric sciences, mathematics, statistics, computer science, data science, environmental science)

Social sciences (for example, sociology, psychology, economics, political science, anthropology, geography)

Professional fields (for example, business, education, family and consumer sciences, agriculture, engineering – generally courses taught outside the College of Liberal Arts and Sciences)

Electives to bring total credits to at least 120 Varies

## Other Requirements

Included in the minimum of 120 credits needed for graduation must be the following:

30 credits from ISU earned during the junior/and or senior year.

39 upper-level (300 level or above) credits from an accredited four-year college with a grade point average of 2.0 or higher.

A minimum grade point average of at least 2.00 (a C average).

No more than 9 credits of 490 (Independent Study) courses may be counted toward graduation.

Students in the B.L.S. program are not eligible for additional majors, but in consultation with their advisor they may earn a Certificate or minor.

Minors attached to a B.L.S. must include 6 credits taken at Iowa State University in upper-level (300 level or above) courses and must include at least 9 credits that are not used to meet any other department, college, or university requirement.

Criteria for graduating with distinction and other academic honors with a B.L.S. degree are available under Scholastic Recognition.

## Requirements for the B.L.S. Degree With a Major in Professional Studies

All students seeking a B.L.S. degree must meet the University-wide requirements (<https://catalog.iastate.edu/collegescurricula/>) for graduation, including earning a total of 120 credits. Students pursuing the Professional Studies major will take coursework across multiple areas aimed to develop broad professional competencies in critical thinking, communication, leadership/teamwork, and technology. Studies may be focused on coursework in closely-related disciplines or diversified over several disciplines.

The Professional Studies major requires 33 credits that meet the distribution area requirements laid out below. Professional Studies students must also meet the General Education, World Languages/Cultures and Career Proficiency Requirements of the College of Liberal Arts and Sciences and earn a minimum of 39 credits at the 300/400 level. Courses taken at Iowa State University on a pass/not pass basis may be counted toward graduation only as electives.

## University-wide Requirements

Communication Proficiency: Foundation Courses		6
ENGL 150	Critical Thinking and Communication	
ENGL 250	Written, Oral, Visual, and Electronic Composition (with a grade of C or better)	
or equivalent of ENGL 150, ENGL 250		
Communication Proficiency: Upper-level curricula (grade C- or better)		3
ENGL 302	Business Communication	
	or ENGL 305 Creative Writing: Nonfiction	
	or ENGL 309 Proposal and Report Writing	
	or ENGL 314 Technical Communication	
or comparable extensive writing experience		
International Perspectives*		3
U.S. Diversity*		3

\*Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how these courses can apply to your graduation plan.

## LAS General Education, World Languages/Cultures, and Career Proficiency Requirements

Arts and humanities*	12
Mathematics, statistics, or computer science*	3
Natural sciences*	8
Social sciences*	9



World languages/Cultures**	3-8
LAS 203	Professional Career Preparation1

\*A list of courses acceptable in the general education groups can be obtained from the college website (<http://www.las.iastate.edu/students/academics/general-education/>).

\*\*The requirement may be met by completion of three or more years of high school study in one world language; by meeting the LAS World Language requirement; or by taking six credits from the list of International Perspectives courses, three credits of which cannot be used to satisfy another degree requirement.

### Distribution Requirements and Electives

Students determine which distribution areas to emphasize in their degree program through consultation with their Bachelor of Liberal Studies academic advisor. Students are encouraged to select classes that prepare them for particular labor sectors and to talk with their advisor about adding at least one minor or certificate.

Distribution Areas (Three credits in each of the four areas below, with a minimum of 9 credits in at least two of the areas. 15 of the 33 credits required for this major must be at the 300 level or above.)33

Critical Thinking (for example, history, philosophy, political science, psychology)
Communication (for example, communication studies, journalism, speech, writing, world language, advertising, public relations)
Leadership/Teamwork (for example, classes that apply to the Leadership Studies certificate or minor)
Technology (for example, computer science, engineering, and other coursework focused on using technology)

Electives to bring total credits to at least 120Varies

### Other Requirements

Included in the minimum of 120 credits needed for graduation must be the following:

30 credits from ISU earned during the junior/and or senior year.

39 upper-level (300 level or above) credits from an accredited four-year college with a grade point average of 2.0 or higher.

A minimum grade point average of at least 2.00 (a C average).

No more than 9 credits of 490 (Independent Study) courses may be counted toward graduation.

Students in the B.L.S. program are not eligible for additional majors, but in consultation with their advisor they may earn a Certificate or minor. Minors attached to a B.L.S. must include 6 credits taken at Iowa State University in upper-level (300 level or above) courses and must include at

least 9 credits that are not used to meet any other department, college, or university requirement.

Criteria for graduating with distinction and other academic honors with a B.L.S. degree are available under Scholastic Recognition.

## Linguistics Overview

Linguistics is a cross-disciplinary program designed to meet the needs of students interested in various aspects of language—its structure, history, varieties, meanings, and uses. The program includes courses in anthropology, computer science, English, psychology, and world languages and cultures, thus providing a multi-disciplinary approach to the study of human language.

Courses in linguistics serve as background for students interested in any career that involves working with language, such as teaching English as a first and as a second language, second language studies, speech-language pathology, cross-cultural communication, law, linguistic anthropology, computational linguistics, and psycholinguistics.

In the College of Liberal Arts and Sciences, courses in linguistics can be applied as electives or as part of the group requirements. They may also be used in a minor or in a major. Linguistics majors earn a Bachelor of Arts.

## Learning Outcomes

Students who major in Linguistics at Iowa State University will be able to

- display extensive knowledge of the primary areas of linguistics, especially syntax, morphology, and phonology/phonetics.
- identify and analyze descriptive and prescriptive approaches to language description.
- display a sophisticated understanding of the hierarchical and systematic nature of human language.
- demonstrate skills in the intersection of language analysis and technology.
- develop methodological skills for carrying out linguistic analysis, including
  - analyzing organized and unorganized linguistic data.
  - conducting research, including carrying out literature searches and reviews, formulating testable questions, developing protocols for collecting data, and drawing conclusions based on research goals.
  - formulating effective linguistic arguments in spoken and written form.

- display understanding of how languages change over time by appealing to examples of change in at least three languages.

## Linguistics Degree Requirements

Majors in linguistics complete a minimum of 36 hours in linguistics with a grade of C or better in each linguistics course. Courses specifically required are:

LING 119	Introduction to World Languages	3
LING 207	Introduction to Symbolic Logic	3
LING 219	Introduction to Linguistics	3
LING 220	Descriptive English Grammar	3
LING 371	Phonetics and Phonology	3
LING 413	Psychology of Language	3
LING 420	History of the English Language	3
LING 437	Grammatical Analysis	3

In addition, linguistics majors must choose 12 credits of elective courses. Discuss choices with the advisor. Suggested areas of further study are:

### Computers and Linguistics

LING 320	Topics in Linguistic Structure	3
LING 331	Theory of Computing	3
LING 410	Language as Data	3

### Second Language Studies

ENGL 322	Language and Society	3
ENGL 324	Introduction to Teaching ESL Literacy	3
ENGL 325	Teaching Methods for ESL Learners: Oral Communication Skills	3
LING 425	Second Language Learning and Teaching	3

### Sociolinguistics and Language

ENGL 319	Studies in Language and Diversity	3
ENGL 322	Language and Society	3
LING 422	Women, Men, and the English Language	3

### Spanish Linguistics

LING 351	Introduction to Spanish-English Translation	3
LING 352	Spanish Pronunciation	3
LING 354	Introduction to Spanish-English Interpretation	3
LING 462	Contrastive Analysis of Spanish/ English for Translators	3
LING 463	Contemporary Spanish Linguistics	3

Additional courses in linguistics include ANTHR 309 and special topics offered through LING 319 and LING 320, which are repeatable for different

topics. They also include courses for study abroad, especially LING 395, and independent studies through LING 490. Majors in linguistics must show proficiency in a second language equivalent to that achieved after two years of university-level study. Alternatively, majors in linguistics can demonstrate university-level study in two other languages of at least one year each.

Communication Proficiency requirement: According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

LIB 160	Introduction to College Level Research	1
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Continuing Communication Proficiency is based on one course from ENGL 314; WLC 370A, 370B or 370C.

For information about using linguistics courses in an interdisciplinary studies major, see Interdisciplinary Studies.

As majors in the College of Liberal Arts and Sciences, Linguistics students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Linguistics, B.A.

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 LING 101	1
LIB 160	1 Humanities Choice	3
World Language/Elective	4 Math Choice	3
LING 119	3 PSYCH 101	3
Natural Science Choice	3 World Language/Elective	4
	<b>14</b>	<b>14</b>

**Sophomore**

Fall	Credits Spring	Credits
ENGL 250	3 LING 371	3
LING 219	3 World Language 202	4
ANTHR 201	3 LING 220	3
Humanities Choice	3 Humanities Choice	3
World Language 201	4 Social Science Choice	3
	LAS 203	1
	<b>16</b>	<b>17</b>

**Junior**

Fall	Credits Spring	Credits
LING 309	3 LING 207	3
LING 437	3 LING 413	3
ENGL 305, 314, or WLC 370	3 LING 420	3
Natural Science Choice	3 Natural Science Choice	3
Elective	3 Elective	3
	<b>15</b>	<b>15</b>

**Senior**

Fall	Credits Spring	Credits
LING Area of Concentration	3 LING Area of Concentration	3
U.S. Diversity	3 Electives	9
Electives	11	
	<b>17</b>	<b>12</b>

## Undergraduate Minor in Linguistics

Minors in linguistics are individually tailored to the interests of the student, who consults with the linguistics advisor to develop the minor program of study. All minors must have a minimum of 15 credits in linguistics, of which 6 must be in courses numbered over 300. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. All programs must include LING 219 Introduction to Linguistics.

## Minor in TESL (Teaching English as a Second Language)

Minor in Teaching English as a Second Language (Minor in TESL) is for undergraduate students.

The Minor in TESL provides concentrated coursework that prepares students to teach English to nonnative speakers of English, either in community programs in the United States or in an overseas location. Students from any program may complete the minor without further studies in linguistics.

For more information, please contact the Linguistics Undergraduate Advisor.

## Concurrent B.A. in Linguistics and M.A. in TESL/Applied Linguistics

A concurrent B.A. in Linguistics and M.A. in TESL and Applied Linguistics offers well-qualified students the opportunity for accelerated study, achieving both degrees within a 5-year time frame. A student enrolled in this program pursues a graduate M.A. degree while simultaneously completing the requirements for the B.A. in Linguistics. Completing the concurrent degree program would enable students to enter the workforce one year earlier than through the traditional M.A. degree pathway. Up to six credits can be double-counted toward the requirements for both degrees. Students applying for the concurrent degree program should be motivated, focused, and able to handle a 16+ credit hour/semester schedule.

### Eligibility (all qualifications must be met to apply):

1. A minimum 45 credits in undergraduate program complete
2. Two years of ISU foreign language study or bilingualism demonstrated by an approved language test (completed or in progress)
3. At least 12 credits of Linguistics courses completed with a major GPA of 3.2 or higher,
4. A minimum cumulative ISU GPA of 3.0

### Timeline

Students should know by the middle of their sophomore year if they are interested in pursuing the concurrent program. We recommend that students plan ahead, and notify the undergraduate linguistics adviser as soon as they know of their intent to apply for the concurrent degree; if possible, the linguistics adviser should be notified of intent to pursue the concurrent degrees by the end of the 4th semester.

Students should apply for concurrent enrollment by the end of the 5<sup>th</sup> semester of study (and no later than the end of the 6<sup>th</sup> semester) by filing the Request for Concurrent Enrollment form from the Graduate College and submitting the application materials (listed below).

If accepted into the concurrent enrollment program, students should begin taking graduate courses (by the onset of the fourth year of study). Students accepted into the concurrent enrollment program will continue to work with the undergraduate linguistics adviser until the BA degree requirements are met. By the onset of the fifth year of study, students should have identified an area for their thesis/creative component and establish a program of study committee (including a major professor).

Students become full-time graduate students upon acceptance into the concurrent degree program. Students are eligible for research assistantships upon entry into the concurrent degree program, although

it should be noted that these opportunities are rare. Student are eligible to apply for a teaching assistantship once all requirements for the BA degree are met; TA selection will follow the standard procedures for the department (including GRE scores).

## How to Apply

The following components make up your application:

1. Fill out the Request for Concurrent Enrollment form from the Graduate College.
2. Write a statement of purpose, usually 1-2 pages, explaining why you want to pursue the M.A. degree.
3. Obtain three letters of recommendation.
4. Create a curriculum plan with the undergraduate linguistics adviser, who works closely with members of the graduate faculty.
5. Writing sample (which can be a paper written for an undergraduate course at ISU).
6. Submit your materials by e-mail to Teresa Smiley in the Graduate English Office at englgrad@iastate.edu.
7. GRE scores (not required for initial application; required if applying for a teaching assistantship).

The admission criteria are generally the same as those required for all graduate students in the department. Application materials are reviewed by the graduate faculty in linguistics, the department's Director of Graduate Education (DOGE), and the department chair; their recommendations are forwarded on to the ISU Graduate College.

## BA in Linguistics

### 120 credits

- 45 credits at 300+
- 36 credits in major (6 graduate credits can double count with graduate degree requirements)
- 9 credits English communication (such as ENGL 314 Technical Communication)
- 12-16 credits of foreign language
- 29 credits in general education: 9 in A&H, 9 in SS, 8 in NS, 3 in math
- Possible linguistics electives:
  - LING 309, LING 318, LING 319, LING 320, LING 322, LING 324, LING 325, LING 422, LING 425, 300-level Spanish LING courses

## MA in TESL/Applied Linguistics

\*\*6 credits (including 510) can count as an elective in the BA degree

## Graduate Minor

A graduate minor in linguistics permits students to investigate various aspects of linguistics, emphasizing the ability to think about language in a systematic and disciplined way and to apply the methods of the field

to research problems in their own disciplines. Graduate courses for the minor may be cross-listed with courses in Anthropology, Communication Disorders, Computer Science, English, Psychology, and World Languages and Cultures.

For those pursuing a master's degree, a declared minor in linguistics consists of 9 credits in linguistics including two foundation courses:

LING 511	Introduction to Linguistic Analysis	3
One of the following:		3
LING 514	Sociolinguistics	
LING 527	Discourse Analysis	
LING 537	Corpus Approaches to Grammatical Analysis	
And one elective from the list of courses approved for graduate credit		3
<b>Total Credits</b>		<b>9</b>

For those pursuing a Ph.D. degree, the minor consists of 12 credits in linguistics including:

LING 511	Introduction to Linguistic Analysis	3
LING 537	Corpus Approaches to Grammatical Analysis	3
And two electives from the list of courses approved for graduate credit		6
<b>Total Credits</b>		<b>12</b>

Additional courses beyond those listed below may be used as electives. The chair of the supervisory committee can provide information about these.

At least one member of the linguistics faculty will serve on a student's program of study committee. A list of faculty members may be obtained from the Linguistics program website. Ph.D. candidates will write one section of the preliminary examination on an area of linguistics. Students in the Master's in Teaching English as a Second Language/Applied Linguistics are not eligible for a graduate minor in linguistics.

## Mathematics

The program in mathematics offers training for students planning to work in mathematics and computation for industry, to continue their studies in graduate school, or to enter secondary education teaching. Students may satisfy the major requirements in several ways, which are designed to meet these various career objectives.

## Student Learning Outcomes

Our graduates will

- understand the fundamentals of a broad range of areas of mathematics, including algebra, analysis, discrete mathematics, geometry, and numerical analysis.

- demonstrate problem solving skills, critical thinking, and analytical reasoning as applied to mathematical problems and modeling.
- construct and effectively communicate rigorous arguments to demonstrate mathematical facts in oral, written, and electronic formats.
- participate in meaningful learning experiences, recognize the central role of mathematics in our society, and develop an appreciation for mathematics as a fundamental intellectual pursuit.

## Curriculum

As majors in the College of Liberal Arts and Sciences, Math students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

### Mathematics Core

All Math majors are required to earn credit for the following core courses:

MATH 101	Orientation in Mathematics	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 201	Introduction to Proofs	3
MATH 265	Calculus III	4
One of the following:		3-4
MATH 317	Theory of Linear Algebra	
MATH 407	Applied Linear Algebra	
<b>Total Credits</b>		<b>19-20</b>

To complete the major, leading to a Bachelor of Science degree, students must choose from one of the following four pathways:

### Standard Mathematics Major

This degree program is designed for students planning to work in industry or those who plan to continue their studies mathematics at the graduate level. Students are required to earn credit for the following courses:

One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 301	Abstract Algebra I	3
MATH 414	Analysis I	3
Additional MATH courses at the 300, 400, or 500 level		15
<b>Total Credits</b>		<b>24-25</b>

Additionally, the courses must include one of the following sequences:

MATH 301 & MATH 403	Abstract Algebra I and Intermediate Abstract Algebra	6
MATH 304 & MATH 314	Combinatorics and Graph Theory	6
MATH 373 & MATH 481	Introduction to Scientific Computing and Numerical Methods for Differential Equations	6
MATH 414 & MATH 415	Analysis I and Analysis II	6
MATH 435 & MATH 436	Geometry I and Geometry II	6

### Mathematics Major with Actuarial Science Certificate

This degree program is designed for students pursuing a career as an actuary or in the financial sector. Students are required to earn credit for the following courses:

MATH 240	Mathematics of Investment and Credit	3
MATH 341	Introduction to the Theory of Probability and Statistics I	4
MATH 414	Analysis I	3
MATH 441	Life Contingencies I	3
MATH 442	Life Contingencies II	3
<b>Total Credits</b>		<b>16</b>

Additionally, students must meet the requirements for the Actuarial Science Certificate (see [www.catalog.iastate.edu/collegeofbusiness/actuarialscience/#certificatetext](http://www.catalog.iastate.edu/collegeofbusiness/actuarialscience/#certificatetext)).

### Mathematics Major with Applications

This degree program is for students who want to specialize in the application of mathematics to an area of study. It is recommended for those who plan to work in industry or those who plan to continue studying their specialization area at the graduate level. Students are required to earn credit for the following courses:

One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
Four of the following:		12-13
MATH 301	Abstract Algebra I	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 341	Introduction to the Theory of Probability and Statistics I	
MATH 350	Number Theory	
MATH 365	Complex Variables with Applications	

MATH 373	Introduction to Scientific Computing	
MATH 385	Introduction to Partial Differential Equations	
MATH 414	Analysis I	
MATH 421	Logic for Mathematics and Computer Science	
MATH 423	Mathematical Modeling in Biology	
MATH 424	Introduction to High Performance Computing	
MATH 469	Introduction to Discrete Mathematics	
MATH 481	Numerical Methods for Differential Equations	

Courses at the 300, 400, or 500 level from the following designations: 12  
 AER E, A B E, ASTRO, BBMB, BCB, BCBIO, BIOL, B M E, B M S, CH  
 E, CHEM, C E, CPR E, COM S, CON E, DS, ECON, E E, E M, ENSCI,  
 FIN, GEN, GEOL, I E, MAT E, M E, MIS, MTEOR, MICRO, NUC E, PHIL,  
 PYSCH, PHYS, S E, SOC, STAT

**Total Credits** 27-29

## Mathematics Major for Teacher Preparation

This degree program prepares students for a career in secondary education.

All students preparing to become teachers need to complete the core Math classes required of all Math majors, the courses laid out below, and the requirements of the Secondary Major in Education including Student Teaching. Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

COM S 107	Windows Application Programming	3-4
or COM S 207	Fundamentals of Computer Programming	
or COM S 227	Object-oriented Programming	
STAT 201	Introduction to Statistical Concepts and Methods	4
MATH 266	Elementary Differential Equations	3-4
or MATH 267	Elementary Differential Equations and Laplace Transforms	
MATH 301	Abstract Algebra I	3
MATH 341	Introduction to the Theory of Probability and Statistics I	4
MATH 414	Analysis I	3
MATH 435	Geometry I	3
MATH 436	Geometry II	3
MATH 397	Teaching Secondary Mathematics Using University Mathematics	3
MATH 497	Teaching Secondary School Mathematics	3
<b>Total Credits</b>		<b>32-34</b>

Complementary Coursework for Teacher Preparation

In addition to the courses required for the Math Major and those required for the Secondary Major in Education, the complementary coursework below is required for those seeking licensure in mathematics. Some of these courses, and some of the required coursework for the Secondary Major in Education, can also apply to LAS general education requirements.

PSYCH 230	Developmental Psychology	3
or HD FS 102	Human Development	
EDUC 280J	Pre-Student Teaching Experience I: Mathematics Clinic	1
EDUC 480C	Pre-Student Teaching Experience III: Mathematics	0.5-2
And one course in American History or Government		3
<b>Total Credits</b>		<b>7.5-9</b>

## University and College Requirements

In addition to the core and pathway courses, students are also required to earn credit for the following courses:

Courses from General Education Area I - Arts and Humanities	<sup>1</sup>	12
Courses from General Education Area IIB - Natural Sciences	<sup>1</sup>	8
Courses from General Education Area III - Social Sciences	<sup>1</sup>	9
LAS Career Proficiency Requirement (LAS 203)		1
Courses meeting the international perspectives requirement	<sup>2</sup>	3
Courses meeting the U.S. diversity requirement	<sup>2</sup>	3
LIB 160	Introduction to College Level Research	1
ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	<sup>3</sup> 3
One of the following:		<sup>4</sup> 3
ENGL 302	Business Communication	
ENGL 303	Free-Lance Writing for Popular Magazines	
ENGL 305	Creative Writing: Nonfiction	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
MATH 491	Undergraduate Thesis	<sup>5</sup>

<sup>1</sup> Possible choices can be found here: <https://las.iastate.edu/students/academics/general-education/>

<sup>2</sup> Courses used to meet the U.S. Diversity and International Perspectives requirements can also be used to fulfill general education requirements.

<sup>3</sup> Students must earn a grade of C or better.

<sup>4</sup> Students must earn a grade of C- or better.

<sup>5</sup> With departmental approval.

Furthermore, students must earn a minimum of 120 credits, including a minimum of 45 credits at the 300 or 400 level, and including at least 8



credits in the major at the 300/400 level with a grade of C or better. At least 55 of these credits must be earned at a four-year institution, and the last 32 credits must be earned at Iowa State University. A maximum of 16 technical credits are allowed, and a maximum of 9 P-NP credits of free electives may apply. Students must also meet the LAS World Language requirement and have a minimum 2.00 ISU cumulative Grade Point Average.

Four Year Plans  
 Mathematics Major

Freshman		
Fall	Credits Spring	Credits
MATH 101	1 MATH 166	4
MATH 165	4 Arts & Humanities Choice	3
ENGL 150	3 Natural Science Choice	4
LIB 160	1 Social Science Choice	3
Natural Science Choice	4	
Electives	3	
	16	14
Sophomore		
Fall	Credits Spring	Credits
MATH 201	3 MATH 266 or 267	3-4
MATH 265	4 MATH 317	4
Arts & Humanities Choice	3 ENGL 250	3
Social Science Choice	3 Social Science Choice	3
Electives	3 LAS 203	1
	16	14-15
Junior		
Fall	Credits Spring	Credits
MATH Sequence Course I	3 MATH Sequence Course II	3
MATH 301 or 414	3 MATH 414 or 301	3
Arts & Humanities Choice	3 Communication Choice	3
Electives/World Language	6 Electives/World Language	6
	15	15
Senior		
Fall	Credits Spring	Credits
MATH 300+	3 MATH 300+	6
Arts & Humanities Choice	3 Electives	9
Electives	9	
	15	15
Total Credits: 120-121		

Mathematics Major with Actuarial Science Certificate

Freshman		
Fall	Credits Spring	Credits
MATH 101	1 MATH 166	4
MATH 165	4 ECON 102	3
ENGL 150	3 STAT 226	3
LIB 160	1 ACCT 284	3
ECON 101	3 Electives	3
Electives	3	
	15	16
Sophomore		
Fall	Credits Spring	Credits
MATH 201	3 MATH 240	3
MATH 265	4 MATH 317	4
FIN 301	3 ENGL 250	3
Arts & Humanities Choice	3 FIN 320	3
Electives	3 Arts & Humanities Choice	3
LAS 203	1	
	17	16
Junior		
Fall	Credits Spring	Credits
STAT 341	4 FIN 424	3
STAT 301 or 326	3-4 STAT 342	4
Natural Science Choice	4 Communication Choice	3
Electives/World Language	3 Natural Science Choice	4
	Electives/World Language	3
	14-15	17
Senior		
Fall	Credits Spring	Credits
MATH 414	3 MATH 442	3
MATH 441	3 Social Science Choice	3
Arts & Humanities Choice	3 Electives	9
Electives	6	
	15	15

Total Credits: 125-126

Mathematics Major with Applications

Freshman		
Fall	Credits Spring	Credits
MATH 101	1 MATH 166	4
MATH 165	4 Arts & Humanities Choice	3
ENGL 150	3 Natural Science Choice	4
LIB 160	1 Social Science Choice	3

Natural Science Choice	4 Specialization Area Prereq.	3
Specialization Area Prereq.	3	
<b>16</b>		<b>17</b>

**Sophomore**

Fall	Credits Spring	Credits
MATH 201	3 MATH 266 or 267	3-4
MATH 265	4 MATH 317	4
Arts & Humanities Choice	3 ENGL 250	3
Social Science Choice	3 Social Science Choice	3
Specialization Area Prereq.	3 LAS 203	1
<b>16</b>		<b>14-15</b>

**Junior**

Fall	Credits Spring	Credits
MATH 300+ or MATH 304	3 MATH 300+ or MATH 314	3
Specialization Area 300+	3 Specialization Area 300+	3
Arts & Humanities Choice	3 Communication Choice	3
Electives/World Language	6 Electives/World Language	6
<b>15</b>		<b>15</b>

**Senior**

Fall	Credits Spring	Credits
MATH 300+	3 MATH 300+	3
Specialization Area 300+	3 Specialization Area 300+	3
Arts & Humanities Choice	3 Electives	9
Electives	6	
<b>15</b>		<b>15</b>

**Total Credits: 123-124****Mathematics Major for Teacher Preparation****Freshman**

Fall	Credits Spring	Credits
MATH 101	1 MATH 166	4
MATH 165	4 STAT 201	4
ENGL 150	3 EDUC 219	1
LIB 160	1 EDUC 280J	1
PSYCH 230 or HD FS 102	3 EDUC 202	3
Arts & Humanities Choice	3 Arts & Humanities Choice	3
<b>15</b>		<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
MATH 201	3 MATH 266 or 267	3-4
MATH 265	4 MATH 317	4
ENGL 250	3 PSYCH 333	3
EDUC 204	3 COM S 107, 207, or 227	3-4

Natural Science Choice	4 Natural Science Choice	4
LAS 203	1	
<b>18</b>		<b>17-19</b>

**Junior**

Fall	Credits Spring	Credits
MATH 301	3 MATH 397	3
MATH 341	4 MATH 436	3
MATH 435	3 EDUC 280A	1-2
EDUC 406	3 SP ED 401	3
Communication Choice	3 Social Sciences Choice	3
	Arts & Humanities Choice	3
<b>16</b>		<b>16-17</b>

**Senior**

Fall	Credits Spring	Credits
MATH 414	3 EDUC 417C	16
MATH 497	3	
EDUC 395	3	
EDUC 480C	0.5-2	
Arts & Humanities Choice	3	
<b>12.5-14</b>		<b>16</b>

**Total Credits: 126.5-131****Undergraduate Minor**

The department offers a minor in mathematics. The minor requires at least 16 credits, including at least 6 credits in courses numbered 300 or above taken at Iowa State University. At least 9 credits must apply exclusively towards the minor and cannot be used to meet any other department, college, or university requirement. Students are required to earn credit for the following courses:

MATH 201	Introduction to Proofs	3
MATH 265	Calculus III	4
One of the following:		3-4
MATH 266	Elementary Differential Equations	
MATH 267	Elementary Differential Equations and Laplace Transforms	
One of the following:		3-4
MATH 317	Theory of Linear Algebra	
MATH 407	Applied Linear Algebra	
One of the following:		3-4
MATH 301	Abstract Algebra I	
MATH 304	Combinatorics	
MATH 314	Graph Theory	

MATH 341	Introduction to the Theory of Probability and Statistics I	
MATH 350	Number Theory	
MATH 365	Complex Variables with Applications	
MATH 373	Introduction to Scientific Computing	
MATH 385	Introduction to Partial Differential Equations	
MATH 414	Analysis I	
MATH 421	Logic for Mathematics and Computer Science	
MATH 423	Mathematical Modeling in Biology	
MATH 435	Geometry I	
MATH 436	Geometry II	
MATH 469	Introduction to Discrete Mathematics	
<b>Total Credits</b>		<b>16-19</b>

## Graduate Study

The department offers programs leading to a Master of Science or Doctor of Philosophy degree in mathematics or applied mathematics, as well as minor work for students whose major is in another department.

Students desiring to undertake graduate work leading to the M.S. or Ph.D. degree should prepare themselves by taking several upper division mathematics courses.

The M.S. degree requires a student to take at least 30 credit hours and to write a creative component or thesis. Additionally, students must pass a comprehensive oral examination over their coursework and their creative component or thesis. See the online Mathematics Graduate Handbook for specific requirements.

The Ph.D. degree requires a student to take 42 credit hours of coursework in addition to research hours, pass written qualifying examinations, pass an oral preliminary exam, and perform an original research project culminating in a dissertation which is defended by an oral exam. Ph.D. candidates must have at least one year of supervised teaching experience. See the on-line Mathematics Graduate Handbook for specific requirements.

## Meteorology

### Overview

Offered by the Department of Geological and Atmospheric Sciences.  
(<https://ge-at.iastate.edu/>)

**The Bachelor of Science Major in Meteorology:** The study of meteorology involves the description of the earth's atmosphere and the processes responsible for its behavior. Students majoring in Meteorology earn a bachelor of science. The major satisfies guidelines specified by the American Meteorological Society and meets education requirements for employment with the National Weather Service and the World

Meteorological Organization. Successful preparation for professional or graduate work in Meteorology requires that the student develop and integrate a diverse range of skills and knowledge bases. These include weather observing, the physics and dynamics of the global atmosphere, application of new weather technologies, advanced mathematical tools, computer programming and modeling, and effective oral and written communication. The faculty view the senior thesis (MTEOR 499 Senior Research), in particular, as a capstone experience in which students demonstrate they have achieved this integration. Also, contemporary meteorology is an earth-system science with ties to a variety of human experiences. The electives and general education requirements of the college are further experiences that the meteorology student must integrate with their core meteorology knowledge in order to function effectively in a globally-oriented profession.

**Meteorology as an Additional Major:** The Meteorology program allows students in academic programs with affinity to meteorology to complete an additional major in meteorology through an accelerated pathway. Students earning a BS degree in electrical or aerospace engineering who complete the designated Meteorology coursework of at least 25 credit hours can earn an additional major in Meteorology. Students should work closely with their advisors in each department to ensure that all requirements are met. Please review the information on the department website or contact the current program head for more information and sample four-year plans to earn an additional major in Meteorology.

### Student Learning Outcomes

Upon graduation, students should be able to:

- Demonstrate the ability to think critically;
- Exhibit a broad understanding of atmospheric systems and processes;
- Demonstrate scientific literacy and its application to scientific inquiry and societal concerns;
- Demonstrate proficiency in data collection, management, and analysis including understanding sources of error and/or uncertainty;
- Read and critically evaluate relevant literature and information;
- Use appropriate tools from chemistry, physics, biology, mathematics, and data science to solve discipline-specific problems;
- Present information effectively in written and oral forms;
- Work in a team environment in alignment with the ISU principles of community;
- Work independently;
- Attain employment in meteorology, atmospheric science or related fields, or pursue graduate studies.

## Degree Requirements

The program requires the following courses:

MTEOR 111	Synoptic Applications	1
MTEOR 201	Introductory Seminar	R
MTEOR 206	Introduction to Weather and Climate	3
MTEOR 227	Computational Meteorology I	3
MTEOR 301	General Meteorology	4
MTEOR 311	Introduction to Synoptic Meteorology	2
MTEOR 341	Atmospheric Physics I	3
MTEOR 342	Atmospheric Physics II	3
MTEOR 399	Writing for Research	2
MTEOR 411	Synoptic Meteorology	3
MTEOR 417	Mesoscale Forecasting Laboratory	3
MTEOR 432	Instrumentation and Measurements	3
MTEOR 443	Dynamic Meteorology I	3
MTEOR 454	Dynamic Meteorology II	3
MTEOR 499	Senior Research	2
<b>Total Credits</b>		<b>38</b>

An additional 9 credits must be chosen from:

MTEOR 402	Watershed Hydrology	3
MTEOR 404	Global Change	3
MTEOR 405	Soil-Plant-Animal-Atmosphere Physics	3
MTEOR 406	World Climates	3
MTEOR 407	Mesoscale Meteorology	3
MTEOR 416	Hydrologic Modeling and Analysis	3
MTEOR 435	Radar Applications in Meteorology	3
MTEOR 440	Tropical Meteorology	3
MTEOR 452	Climate Modeling	3
MTEOR 489	Survey of Remote Sensing Technologies	3
MTEOR 489L	Satellite Remote Sensing Laboratory	1
MTEOR 490	Independent Study	1-3
GEOL 415	Paleoclimatology	3
GEOL 452	Intro GIS for Geoscientists	3
C E 372	Engineering Hydrology and Hydraulics	3

Supporting work is required in areas at least equivalent to:

One of the following sequences 5

CHEM 163 & 163L	College Chemistry and Laboratory in College Chemistry
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Or

CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I
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PHYS 231 & 231L	Introduction to Classical Physics I and Introduction to Classical Physics I Laboratory	5
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PHYS 232	Introduction to Classical Physics II	4
MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 265	Calculus III	4
MATH 266	Elementary Differential Equations	3
STAT 305	Engineering Statistics	3
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>35</b>

A grade of C or better (not C-) is required in each of the following courses to meet minimum graduation requirements for a bachelor of science degree in Meteorology:

MTEOR 206	Introduction to Weather and Climate	3
MTEOR 301	General Meteorology	4

Several co-op programs are available for upper-division undergraduates. Although a range of opportunities exists for men and women who terminate their studies with a bachelor of science, students who meet the necessary academic standards are encouraged to continue their studies in a graduate program. For these students, additional coursework is recommended in mathematics or physical science. Other students can choose a wide range of supporting courses that will contribute to their particular area of interest in meteorology.

**Communication Proficiency requirement:** According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	
MTEOR 399	Writing for Research	2
MTEOR 499	Senior Research	2

As majors in the College of Liberal Arts and Sciences, Climate Science students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

Liberal Arts and Sciences (LAS) majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the Communication Proficiency, LAS world language requirements, and LAS career proficiency requirement. Six semesters of one foreign language in high school satisfies the World Language requirement.

Students in all ISU majors must complete a 3-credit course in U.S. diversity and a 3-credit course in international perspectives. Discuss with your advisor how the two courses that you select can be applied to address general education requirements. Check for a list of approved courses at: <http://www.registrar.iastate.edu/courses/div-ip-guide.html>.

## Four Year Plans

These plans are examples only; students should discuss their graduation plans with their advisor.

### Path 1 for students prepared to start in calculus

#### Freshman

Fall	Credits Spring	Credits
MTEOR 111	1 MTEOR 113	1
MTEOR 112	1 MTEOR 206	3
MATH 165	4 MATH 166	4
CHEM 163 or 177 <sup>1</sup>	4 PHYS 231	4
CHEM 163L or 177L <sup>1</sup>	1 PHYS 231L	1
ENGL 150	3 Humanities/Social Science Choice	3
LIB 160	1	
	<b>15</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
MTEOR 201	R MTEOR 301	4
MTEOR 227	3 MATH 266	3
ENGL 250	3 SP CM 212	3
MATH 265	4 STAT 305	3
PHYS 232	4 Humanities/Social Science Choice	3
	LAS 203	1
	<b>14</b>	<b>17</b>

#### Junior

Fall	Credits Spring	Credits
MTEOR 311	2 MTEOR 342	3
MTEOR 341	3 MTEOR 399	2
MTEOR 443	3 MTEOR 454	3
World Language/Elective	3-4 World Language/Elective	3-4
Humanities/Social Science Choice	3 Humanities/Social Science Choice	3
	Humanities/Social Science Choice	3
	<b>14-15</b>	<b>17-18</b>

#### Senior

Fall	Credits Spring	Credits
MTEOR 411	3 MTEOR 417	3
MTEOR 499	2 MTEOR 432	3
Meteorology Elective/ elective Choice <sup>2,3</sup>	3 Meteorology Elective/ Elective Choice <sup>2,3</sup>	1-3
Meteorology Elective/ Elective choice <sup>2,3</sup>	3 Meteorology Elective/ Elective Choice <sup>2,3</sup>	3
Humanities/Social Science Choice	3 Humanities/Social Science Choice	3
	<b>14</b>	<b>13-15</b>

#### Total Credits: 120-124

<sup>1</sup> Students taking CHEM 177 should plan to take CHEM 178 as well.

<sup>2</sup> Students must select at least 9 credits from a list of optional courses.

<sup>3</sup> Students should select a humanities or social science course based on need. If these LAS requirements have been satisfied, students may select a meteorology elective or alternate course. Students should discuss possible alternate course options with their advisor.

### Path 2 for students needing preparatory mathematics

#### Freshman

Fall	Credits Spring	Credits
MTEOR 112	1 MTEOR 113	1
MATH 143	4 MATH 165	4
ENGL 150	3 MTEOR 206	3
CHEM 163	4 SP CM 212	3
CHEM 163L	1 Humanities/Social Science Choice	3
LIB 160	1 Humanities/Social Science Choice	3
	<b>14</b>	<b>17</b>

#### Sophomore

Fall	Credits Spring	Credits
MTEOR 111	1 MATH 265	4
MTEOR 201	R MTEOR 301	4
MTEOR 227	3 STAT 305	3
ENGL 250	3 PHYS 232	4
MATH 166	4 LAS 203	1
PHYS 231	4	
PHYS 231L	1	
	<b>16</b>	<b>16</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MTEOR 311	2 MTEOR 342	3
MTEOR 341	3 MTEOR 399	2
MTEOR 443	3 MTEOR 454	3
MATH 266	3 World Language/Elective	3-4
World Language/Elective	3-4 Humanities/Social Science Choice	3
	Humanities/Social Science Choice	3
<b>14-15</b>		<b>17-18</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MTEOR 411	3 MTEOR 417	3
MTEOR 499	2 MTEOR 432	3
Meteorology Elective/ Elective Choice <sup>2,3</sup>	3 Meteorology Elective/ Elective Choice <sup>2,3</sup>	3
Meteorology Elective/ Elective Choice <sup>2,3</sup>	3 Meteorology Elective/Elective Choice <sup>2,3</sup>	0-3
Humanities/Social Science Choice	3 Humanities/Social Science Choice	3
<b>14</b>		<b>12-15</b>

**Total Credits: 120-125**<sup>1</sup> Students taking CHEM 177 should plan to take CHEM 178 as well.<sup>2</sup> Students must select at least 9 credits from a list of optional courses.<sup>3</sup> Students should select a humanities or social science course based on need. If these LAS requirements have been satisfied, students may select a meteorology elective or alternate course. Students should discuss possible alternate course options with their advisor.

## Minor

The department offers a minor in Meteorology which may be earned by completing 15 credits including MTEOR 111 Synoptic Applications (only 1 credit may count toward the minor), MTEOR 206 Introduction to Weather and Climate and MTEOR 301 General Meteorology. The minor must include at least 6 credits in the courses numbered 300 or above taken at Iowa State University and must include at least 9 credits that are not used to meet any other department, college or university requirement. Further information concerning programs of study, including sample degree programs, is available from the department.

## Concurrent Programs

**Combined Degrees:** A concurrent program is offered which combines a bachelor of science degree in meteorology and a master of science degree in meteorology. This program gives well-qualified Iowa State juniors

and seniors the opportunity to begin working on the M.S. degree before completing the B.S. degree, reducing by at least one year the normal time period necessary to complete both degrees separately. Additionally, a concurrent program exists that gives students the opportunity to receive a B.S. in meteorology and an M.B.A. (master of business administration) within five years. Review the department website or contact the current program head for more information regarding these options.

## Graduate Meteorology

The department offers programs leading to the master of science (M.S.) and doctor of philosophy (Ph.D.) in Meteorology. Students desiring a major in Meteorology normally will have a strong undergraduate background in the physical and mathematical sciences. Individuals desiring to enter a graduate program are evaluated by considering their undergraduate preparation and performance along with their expressed goals in the statement of purpose. Prospective students are encouraged to reach out to individual faculty members who they wish to work with prior to applying.

Programs of study are designed on an individual basis in accordance with the requirements of the Graduate College and established requirements for each departmental major. Additional coursework is normally taken in complementary areas such as aerospace engineering, agronomy (soil science), chemistry, civil and construction engineering, computer engineering, computer science, engineering mechanics, environmental science, materials engineering, mathematics, mechanical engineering, microbiology, physics, or statistics. Departmental requirements provide a strong, broad background in the major and allow considerable flexibility in the program of each individual.

A thesis is required of all M.S. candidates, and a dissertation is required of all Ph.D. candidates.

Course requirements for the M.S. degree include MTEOR 542 and MTEOR 543, along with at least four courses from the graduate Meteorology electives (MTEOR 502, MTEOR 504, MTEOR 505, MTEOR 507, MTEOR 516, MTEOR 518, MTEOR 535, MTEOR 540, MTEOR 552, MTEOR 568, MTEOR 589, or MTEOR 605) or from outside the department according to the students' professional goals and interests, in consultation with their advisor and POS committee. Students without prior synoptic meteorology course work must complete MTEOR 511 and may substitute these credits in place of other elective courses.

Graduates in Meteorology have a good comprehension of basic principles, a capacity for critical and independent thought, and an ability to communicate effectively with scientific colleagues. They have an appropriate breadth in their understanding of meteorology with a suitable specialization. Graduates are able to undertake thorough research and explain the results in a scientifically reasonable fashion.



# Middle Eastern Studies Minor

## Overview

The cross-disciplinary Middle Eastern Studies Minor is designed for students who seek to explore the cultures, languages, history, society, politics, international relations, economics, technology, and environment of the Middle East, including the Arab world, North Africa, Turkey, and Iran. The Middle Eastern Studies Minor's courses provide the background and training for students whose major fields of study might include Anthropology, History, Philosophy and Religious Studies, Political Science, and World Languages and Cultures. The minor should be of special interest to students with interests in graduate studies or career interests in international business, education, translation, law, diplomacy, intelligence, the military, national security, non-governmental organizations, and/or international organizations.

## Student Learning Outcomes

After completing the minor in Middle Eastern Studies, students will demonstrate:

- some proficiency in oral and written Arabic with an ability to comprehend authentic Arabic texts
- knowledge of the history of the Middle East from classical to modern times
- knowledge of the geographic features of the Middle East and of the major political boundaries, alliances, and power struggles that characterize the contemporary Middle East
- an understanding of cultural diversity issues in the Middle East in the context of the prevalent political, social, and cultural institutions and structures

The minor in Middle Eastern Studies requires 15 credit hours

## Required course work in core courses (9 credits total)

HIST 435	History of the Modern Middle East	3
POL S 350	Politics of the Middle East	3
RELIG 358	Islam	3

## At least 6 additional credits of elective courses from the following list (this list may change/be updated as new elective courses become available)

ARABC 201	Intermediate Arabic I	4
ARABC 202	Intermediate Arabic II	4
ARABC 375	Arab Culture	3
ART H 384	Art of Islam	3
ECON 496	Economics International Travel Course	1-3
HIST 331	History of the Islamic World to 1800	3
RELIG 242	History of Christianity: Early to Medieval	3

RELIG 359	The Quran	3
WLC 370B	Topics in World Languages and Cultures in English Translation: Middle East	3

**Language co-requisite:** All students pursuing the minor in Middle Eastern Studies must complete and receive a passing grade in:

ARABC 101 Elementary Arabic I and ARABC 102 Elementary Arabic II [completion of the beginning level of other languages spoken in the Middle East (e.g. Hebrew, Farsi, Kurdish, Turkish, Pashto, etc.) will be accepted in lieu of beginner Arabic upon petition to the program Directors]

## Military Science Program

### Overview

The Military Science Department is embedded within the College of Liberal Arts and Sciences as an interdisciplinary program, but does not offer an academic degree. The mission of the department is derived directly from regulations governing Army Reserve Officers' Training Corps (AROTC), which are issued by the U.S. Army Cadet Command and U.S. Army Training and Doctrine Command and cannot be modifiable by this department.

### Freshmen Year Learning Outcomes

The student will have a working knowledge of the following areas: The Role of the Army, Roles and Origins of the Army, Army Customs and Traditions, Branches (Jobs) in the Army and Military Operations and Tactics, U.S. Army leadership and character development.

### Sophomore Year Learning Outcomes

The student will have a working knowledge of the following areas: The Role of an Officer, Role of the Officer and Noncommissioned Officer, communications, code of conduct, first aid, principles of war and military operations and tactics, and begin to apply U.S. Army leadership through observed activities and demonstrate character development traits.

### Junior Year Learning Outcomes

The student will have a working knowledge of the following areas: Small Unit Training, Command and Staff Functions, Nuclear, Biological and Chemical Warfare, Law of War, Weapons, Human Behavior, Math Reasoning, Computer Science and Military Operations and Tactics; Cadets will actively analyze character development and assess leadership skills.

### Senior Year Learning Outcomes

The student will have a working knowledge of the following areas: Transition to Becoming an Officer, Military Justice, Intelligence and Electronic Warfare, Army Personnel Management, Army Logistics, Post and Installation Support and Military Operations and Tactics; Cadets

will internalize and adhere to the U.S. Army's profession through active leadership and congruence of character development.

The mission of the Army Reserve Officers' Training Corps (AROTC) is to commission the future leaders of the United States Army. Since ROTC produces over 65 percent of the Army's Officer Corps, our task is one of the most important undertakings in the Army and our country today. We seek top quality college students. We train these potential leaders, assess their abilities, and challenge them with the highest standards of profession/professionalism. Those who successfully complete the program, receive a commission as a second lieutenant in the U.S. Army. A commission as an Army officer affords the opportunity to pursue a profession in one or several of the 300 different jobs held by Army officers. Students may request to serve as an officer in either the active army, or part time in the Army Reserve or National Guard. Regardless of the method of service, officers in today's Army can be proud to know that they are doing their share in the defense of the United States of America.

The ISU Military Science program is divided into two segments, the basic program and the advanced program. The basic program (courses numbered 101-290) is designed primarily for freshmen and sophomores. No military obligation is incurred by a person participating in the basic program. The basic program is designed to be informative and to acquaint students with the military as a profession. The basic program or an allowed substitute is a prerequisite for the advanced program. Financial assistance is available on a competitive basis.

Persons interested in Military Science should visit the department located on the second floor of the Armory (east side).

## Basic Program

The basic program courses are primarily for freshmen and sophomore students and, except for persons with prior military service and basic training graduates, are required for entry into the advanced program. Each scholarship cadet in the Basic Program receives a monthly allowance for up to 10 months. The curriculum is designed to train freshmen and sophomores in individual and team skills. It also helps the Professor of Military Science identify individual leader developmental needs.

## Advanced Program

The advanced program courses are for students who have completed the basic program (or received equivalent credit) and are mandatory for potential commissioning upon contracting at the beginning of their junior year. Each cadet receives a monthly allowance for up to 10 months. These courses are primarily taught to academic juniors and seniors.

Successful completion normally obligates the student to military service on active or reserve duty. In addition to the advanced program of study, a student (cadet) will be expected to pass the Army Physical Fitness

Test (precondition for commissioning) each semester and continually maintain military appearance standards in both personal grooming and uniform. Physical fitness training is regularly conducted outside of class and laboratory hours in a separate course, M S 150 Army Physical Readiness. Students are encouraged to attend and participate in this class.

Professional Military Science Education (PME) coursework outside of the military science curriculum is also a precondition to commissioning. The PME component consists of Basic Academic proficiency standards. These standards are explained to prospective students as they consider enrollment in the advanced program. Army Uniforms will be worn at least once a week. The 300-level courses are designed to prepare cadets for the Advanced Course, which is a 37 day summer internship/training program where cadets are trained to Army standards, develop leadership skills, and have their officer potential evaluated. The 400-level courses are the final preparation for commissioning as a second lieutenant in the United States Army. Students must meet academic alignment criteria and receive basic program credit before entering the advanced program.

## Military Studies Minor

The College of Liberal Arts and Science offers a minor in Military Studies. Requirements for the minor include taking a minimum of 15 credits of ROTC instruction, which may be taken from one or a number of the ROTC programs. At least 6 credits must be in courses numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Military Studies Minor Interdepartmental Minor

The Military Studies program is designed for students interested in learning about military skills and careers. The mission of the Reserve Officers' Training Corps (ROTC) programs is threefold. First, students are developed mentally, morally, and physically in order to make them strong leaders. Second, a desire for development in mind and character is instilled in students so they may assume the highest responsibilities of command, citizenship, and government. Finally, students are imbued with the highest ideals of duty, honor, and loyalty in order to graduate with a basic professional background and motivation toward their careers.

The Military Science, Naval Science and Air Force Aerospace departments accomplish this mission through detailed courses of instruction occurring throughout a typical student's college career. All academic courses offered by these departments focus on the development of professional military skills and their application. Each department offers courses unique to its branch of the military. Students in Army ROTC classes gain an appreciation for ground warfare and doctrine, while students in Naval Science develop an appreciation for naval surface and maritime engineering. The Air Force Aerospace

Studies curriculum familiarizes students with Air Force structure and doctrine. On a broader scale, all three departments offer courses promoting leadership and sound management practices that investigate the military's role in American domestic and foreign policy, and can be employed in any career path.

Military Science, Naval Science and Air Force Aerospace courses are offered in the interdepartmental Military Studies program in the following participating departments: Military Science, Naval Science and Air Force Aerospace Studies. Students may contact any one of the three departments for additional information on the minor.

### Contact Information:

#### Air Force Aerospace Studies

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[airforce.iastate.edu](https://www.airforce.iastate.edu/) (<https://www.airforce.iastate.edu/>)

[AFROTC@iastate.edu](mailto:AFROTC@iastate.edu)

515-294-1716

#### Military Science Department - Army

132 Armory

[armyrotc.iastate.edu](https://www.armyrotc.iastate.edu/) (<https://www.armyrotc.iastate.edu/>)

[arotc@iastate.edu](mailto:arotc@iastate.edu)

515-294-1852

#### Naval Science Department

3 Armory

[navy.iastate.edu](https://www.navy.iastate.edu/) (<https://www.navy.iastate.edu/>)

[isunrotc@iastate.edu](mailto:isunrotc@iastate.edu)

515-294-0650

## Undergraduate Minor

Undergraduate study in this program provides the student with an opportunity to develop a minor in Military Studies. The three Iowa State University ROTC programs offer over 64 credits of specialized coursework. The minor in Military Studies is open to any Iowa State University student.

Undergraduate students may minor in Military Studies by taking 15 credits of coursework from a combination of any of the three ROTC programs - regardless of whether or not a commission in the Armed Forces is tendered. At least 6 of the 15 credits must be in courses numbered 300 or above. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

See the Military Studies Overview tab for links to the three departments.

## Music

### Administered by the Department of Music and Theatre

#### Undergraduate Study

The Department of Music and Theatre offers a strong undergraduate music program, where students study with full-time faculty professionals in a supportive environment that encourages students to become their best. Two degrees are offered in music: a bachelor of music, which is more specialized and contains fewer general education requirements; and a bachelor of arts degree with a major in music. (The Department of Music and Theatre also administers the Theatre Program, see Theatre and Performing Arts.)

The music curriculum provides:

1. A comprehensive program of professional studies for students who wish to prepare for careers in music, including teaching, performance, and composition, and for students who plan to pursue graduate studies in music.
2. Courses in music literature, theory and areas of performance for all students, regardless of major.

The department embodies the land-grant philosophy of service to the people of the state with a faculty of active scholars, teachers, and artists committed to excellence in teaching, creative/scholarly work, and arts outreach. The department is an accredited institutional member of the National Association of Schools of Music (NASM).

### Student Learning Outcomes

Music graduates will understand and demonstrate:

1. Knowledge of music cultural heritage and history
2. Appreciation for musical creativity, reasoning, and the aesthetic value of music
3. Knowledge of organization and structures of music
4. Analytical skills necessary for listening, performing, and teaching
5. Skills necessary to perform music from a variety of periods, styles, and genres
6. Necessary abilities to communicate ideas musically, verbally, and in writing
7. Awareness of the diversity of musical ideas throughout the world's cultures
8. For Music Education students: success in meeting the ISU Teaching Standards as outlined by the University Teacher Education Program

Assessment measures include the continuation examination, graduating senior surveys and exit interviews, public performances, senior projects, course grades, teacher certification (for music education students), and the National Association of Schools of Music accreditation review.

## Curricula Available to Music Majors

Students interested in pursuing an emphasis in music theater should see Theatre and Performing Arts.

As majors in the College of Liberal Arts and Sciences, Music students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the degree (Bachelor of Music) or major (Music Major, B.A.).

### Bachelor of Music

This curriculum leads to the degree bachelor of music. This degree is more specialized and contains fewer general education requirements than the bachelor of arts degree with a major in music. Students in this curriculum choose between options in education, performance, and composition. To obtain a bachelor of music degree, a student must earn a minimum of 122 credits, including a minimum of 32 credits in residence at Iowa State University and a minimum of 45 advanced credits in courses numbered 300 or above and must meet all of the requirements specified below.

Courses taken on a pass/not pass basis may be counted toward the required total credits, and may be used to meet the advanced credit requirement, if appropriate, but may not be used to satisfy any other graduation requirement.

### Degree Requirements

GENERAL EDUCATION REQUIREMENTS (Students choosing the music education option should consult their advisors.) 31 cr.

Social Science	6
Humanities	6
MUSIC 383 History of Music I	3
MUSIC 384 History of Music II	3
Natural Sciences	3
Mathematics, Natural Sciences	6
Electives (not Music)	4
OTHER REQUIREMENTS 16 Cr.	
ENGL 150 Critical Thinking and Communication	3
ENGL 250 Written, Oral, Visual, and Electronic Composition *	3
LIB 160 Introduction to College Level Research	1
World Languages and Cultures	8
LAS 203 Professional Career Preparation	1
MUSIC CORE 41 CR.	
MUSIC 120 Introduction to Music Literature and Styles	3
MUSIC 224 Music Theory I	4
MUSIC 225 Aural Theory I	1
MUSIC 234 Music Theory II	3
MUSIC 235 Aural Theory II	1

MUSIC 334	Music Theory III	3
MUSIC 335	Aural Theory III	1
MUSIC 344	Music Theory IV	3
MUSIC 345	Aural Theory IV	1
MUSIC 361	Conducting I	2
All of the following are required, 12 cr. minimum total:		12
MUSIC 119	Applied Music for Majors	
MUSIC 219	Applied Music: Majors	
MUSIC 319	Applied Music: Majors	
MUSIC 419	Applied Music: Majors	
Ensembles: see Ensemble Requirement and Options below for details		7
MUSIC 420	Junior/Senior Recital	R
OPTION: select from the list below		34-54.5
<b>Total Credits</b>		<b>122-142.5</b>

### Select one of the following options:

- Vocal Education K-12
- Instrumental Education K-12
- Voice
- Piano
- Organ
- String instruments
- Wind or percussion instrument
- Composition

**Vocal Education K-12, 54.5 Credits (Also see Index, Teacher Education.) MUSIC CLASSES TAKEN BY OTHER BACHELOR OF MUSIC STUDENTS REQUIRE MINIMUM GRADE C-, AND SUPPLEMENTAL MUSIC OPTION COURSES REQUIRE MINIMUM GRADE C.**

MUSIC 248	Technology in Music Instruction	2
MUSIC 266	Introduction to Music Education	2
MUSIC 327B	Functional Piano: Voice Majors	2
MUSIC 358A	Lab Ensemble: Choral	R
MUSIC 360	Voice Pedagogy	2
MUSIC 362A	Conducting II: Choral Conducting Techniques	2
MUSIC 366	Methods of Music Education	2
MUSIC 367	Choral Literature	2
MUSIC 374	Instrumental Methods for Vocalists	1
8 credits of each of the following:		16
MUSIC 417R	Student Teaching: Music-Elementary	
MUSIC 417S	Student Teaching: Music-Secondary	
MUSIC 465	Choral Materials and Methods	2
MUSIC 466	Program Development and Evaluation in Music Education	2

Credit in the following:	4.5
MUSIC 280K Pre-Student Teaching Experience I: Music	
MUSIC 480K Pre-Student Teaching Experience III: Music (repeatable)	
One of the following:	3
MUSIC 301 Opera Studio	
THRE 354 Musical Theatre History and Performance	
THRE 355 Musical Theatre Auditions and Performance	
EDUC 204 Social Foundations of Education in the United States: Secondary	3
EDUC 406 Social Justice Education and Teaching: Secondary	3
EDUC 426 Principles of Secondary Education	3
SP ED 401 Teaching Secondary Students with Exceptionalities in General Education	3
<b>Total Credits</b>	<b>54.5</b>

**Instrumental Education K-12, 53.5-54.5 credits (Also see Index, Teacher Education.) MUSIC CLASSES TAKEN BY OTHER BACHELOR OF MUSIC STUDENTS REQUIRE MINIMUM GRADE C-, AND SUPPLEMENTAL MUSIC OPTION COURSES REQUIRE MINIMUM GRADE C.**

MUSIC 248 Technology in Music Instruction	2
MUSIC 266 Introduction to Music Education	2
MUSIC 350 Instrumental Techniques: Strings	1
MUSIC 351 Instrumental Techniques: Clarinet, Flute, Saxophone	2
MUSIC 352 Instrumental Techniques: Oboe, Bassoon	1
MUSIC 353 Instrumental Techniques: Trumpet, Horn	1
MUSIC 354 Instrumental Techniques: Trombone, Baritone, Tuba	1
MUSIC 355 Instrumental Techniques: Percussion	1
MUSIC 358B Lab Ensemble: Instrumental	R
MUSIC 362B Conducting II: Instrumental Conducting Techniques	2
MUSIC 366 Methods of Music Education	2
MUSIC 375 Choral Methods for Instrumentalists	1
One of the following:	1-2
MUSIC 368 Marching Band and Jazz Ensemble Techniques (2 cr.)	
MUSIC 369 String Pedagogy (1 cr)	
MUSIC 464 Instrumental Administration, Materials, and Methods	2
MUSIC 466 Program Development and Evaluation in Music Education	2
8 credits of each of the following:	16

MUSIC 417R Student Teaching: Music-Elementary	
MUSIC 417S Student Teaching: Music-Secondary	
Credit in the following:	4.5
MUSIC 280K Pre-Student Teaching Experience I: Music	
MUSIC 480K Pre-Student Teaching Experience III: Music (repeatable)	
EDUC 204 Social Foundations of Education in the United States: Secondary	3
EDUC 406 Social Justice Education and Teaching: Secondary	3
EDUC 426 Principles of Secondary Education	3
SP ED 401 Teaching Secondary Students with Exceptionalities in General Education	3
<b>Total Credits</b>	<b>53.5-54.5</b>

**Voice, 34 credits**

MUSIC 327B Functional Piano: Voice Majors	2
Additional credits in these courses:	8
MUSIC 319A Applied Music: Majors: Voice	
MUSIC 419A Applied Music: Voice	
MUSIC 324 English and Italian Diction for Singing	2
MUSIC 325 French and German Diction for Singing	2
MUSIC 360 Voice Pedagogy	2
One of the following:	3
MUSIC 440 Seminar in Music Theory	
MUSIC 446 Sound Synthesis Design for Electronic Music	
One of the following:	3
MUSIC 472 History of American Music	
MUSIC 473 Topics in Advanced Music History	
MUSIC 415A Literature and Pedagogy in Applied Music: Voice (Lit.)	2
Second world language	8
Electives	2
<b>Total Credits</b>	<b>34</b>

**Piano, 34 credits**

Additional credits in these courses:	12
MUSIC 119B Applied Music for Majors: Piano	
MUSIC 219B Applied Music: Majors: Piano	
MUSIC 319B Applied Music: Majors: Piano	
MUSIC 419B Applied Music: Piano	
5 credits from:	5
MUSIC 321 Advanced Ensemble (5 credits of 321 topics)	
MUSIC 327A Functional Piano: Keyboard majors.	2
5 credits from:	5

MUSIC 415B	Literature and Pedagogy in Applied Music: Piano (Lit. & Ped.)	
One of the following:		3
MUSIC 440	Seminar in Music Theory	
MUSIC 446	Sound Synthesis Design for Electronic Music	
One of the following:		3
MUSIC 472	History of American Music	
MUSIC 473	Topics in Advanced Music History	
Electives		4
<b>Total Credits</b>		<b>34</b>

### Organ, 34 credits

Credits from these courses:		4
MUSIC 119B	Applied Music for Majors: Piano	
MUSIC 219B	Applied Music: Majors: Piano	
Additional credits in these courses:		8
MUSIC 319C	Applied Music: Majors: Organ	
MUSIC 419C	Applied Music: Organ	
MUSIC 300 level or above		3
5 credits from:		5
MUSIC 415C	Literature and Pedagogy in Applied Music: Organ (Lit. & Ped.)	
One of the following:		3
MUSIC 472	History of American Music	
MUSIC 473	Topics in Advanced Music History	
One of the following:		3
MUSIC 440	Seminar in Music Theory	
MUSIC 446	Sound Synthesis Design for Electronic Music	
Second world language		8
<b>Total Credits</b>		<b>34</b>

### String instruments, 34 credits

Additional credits in these courses:		12
MUSIC 119D	Applied Music for Majors: Strings	
MUSIC 219D	Applied Music: Majors: Strings	
MUSIC 319D	Applied Music: Majors: Strings	
MUSIC 419D	Applied Music: Strings	
Additional credits in these courses:		6
MUSIC 181	Symphony Orchestra	
MUSIC 321	Advanced Ensemble	
One of the following:		3
MUSIC 440	Seminar in Music Theory	
MUSIC 446	Sound Synthesis Design for Electronic Music	
One of the following:		3

MUSIC 472	History of American Music	
MUSIC 473	Topics in Advanced Music History	
MUSIC 415D	Literature and Pedagogy in Applied Music: Strings (Lit. & Ped.)	4
Electives		6
<b>Total Credits</b>		<b>34</b>

### Wind or percussion instrument, 34 credits

Additional credits in these courses:		12
MUSIC 119	Applied Music for Majors	
MUSIC 219	Applied Music: Majors	
MUSIC 319	Applied Music: Majors	
MUSIC 419	Applied Music: Majors	
3 credits from:		3
MUSIC 321	Advanced Ensemble	
MUSIC 300 level or above		3
One of the following:		3
MUSIC 440	Seminar in Music Theory	
MUSIC 446	Sound Synthesis Design for Electronic Music	
One of the following:		3
MUSIC 472	History of American Music	
MUSIC 473	Topics in Advanced Music History	
MUSIC 415	Literature and Pedagogy in Applied Music	4
Electives		6
<b>Total Credits</b>		<b>34</b>

### Composition, 34 credits

4 credits from:		4
MUSIC 290C	Special Problems: Composition	
12 credits from:		12
MUSIC 490C	Independent Study: Composition	
MUSIC 246	Introduction to Creative Digital Music	2
MUSIC 362A	Conducting II: Choral Conducting Techniques	2
MUSIC 362B	Conducting II: Instrumental Conducting Techniques	2
6 credits from the following:		6
MUSIC 346	Computer Music Programming Design	
MUSIC 440	Seminar in Music Theory	
MUSIC 446	Sound Synthesis Design for Electronic Music	
MUSIC 490B	Independent Study: Theory	
MUSIC 490I	Independent Study: Electronic Music	
One of the following:		3
MUSIC 472	History of American Music	
MUSIC 473	Topics in Advanced Music History	



Electives	3
<b>Total Credits</b>	<b>34</b>

**Bachelor of Arts—Music Major**

A more general degree than the bachelor of music, the bachelor of arts degree requires no formal specialization. It includes more general education requirements and provides a broader course of academic study.

As majors in the College of Liberal Arts and Sciences, Music Majors (Music, B.A.) students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

Candidates for the degree bachelor of arts with a music major will normally complete 48 credits of music including the following required courses:

4 credits:		4
MUSIC 119	Applied Music for Majors	
MUSIC 120	Introduction to Music Literature and Styles	3
4 credits:		4
MUSIC 219	Applied Music: Majors	
MUSIC 224	Music Theory I	4
MUSIC 225	Aural Theory I	1
MUSIC 234	Music Theory II	3
MUSIC 235	Aural Theory II	1
MUSIC 319	Applied Music: Majors	2
MUSIC 334	Music Theory III	3
MUSIC 335	Aural Theory III	1
MUSIC 344	Music Theory IV	3
MUSIC 345	Aural Theory IV	1
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3
4 credits from:		4
MUSIC 111	Wind Ensemble	
MUSIC 113	Jazz Ensemble	
MUSIC 115	Symphonic Band	

MUSIC 141	Lyrica Ensemble	
MUSIC 151	University Chorus	
MUSIC 161	Iowa State Singers	
MUSIC 181	Symphony Orchestra	
MUSIC 321	Advanced Ensemble	
MUSIC 301	Opera Studio	
Music Electives		8
<b>Total Credits</b>		<b>48</b>

Bachelor of arts students whose chief professional interest lies in research are encouraged to minor in world languages and cultures, history, literature, or philosophy.

**General Requirements**  
**Entrance Audition.**

In order to be accepted as a music major, a prospective student must pass an entrance audition for the applied faculty in his/her performance area (piano, organ, woodwinds, strings, percussion, brass, or voice). Passing the audition is dependent on the demonstration of performance skills appropriate for college level instruction and the potential to perform at a professional level. In addition, the number of students accepted must balance with the space available in the corresponding applied studios. Once accepted, a student must complete a placement examination in keyboard skills. This examination is normally given by members of the departmental faculty the week preceding the opening of classes for fall semester.

**Seminars and Recitals.**

All music majors enrolled for applied music courses will attend a weekly 1-hour seminar in their areas, departmental recitals, and 12 recitals of their choosing each semester.

**Ensemble Requirement.**

See the options above for additional ensemble requirements.

**All Bachelor of Music students:**

Enrollment in an ensemble course, chosen from the lists below, each semester of full-time enrollment (except during student teaching) is required.

**Students in a music education option:**

At least six semesters of large ensemble and one semester of chamber music ensemble, chosen from the lists below, are required. One semester of 114A may count as a large ensemble.

**Bachelor of Music students in options other than education:**

At least 2 semesters of large ensemble and one semester of chamber music ensemble, chosen from the lists below, are required.

## Large Ensembles:

MUSIC 111	Wind Ensemble	1
MUSIC 115	Symphonic Band	1
MUSIC 141	Lyrca Ensemble	1
MUSIC 151	University Chorus	1
MUSIC 161	Iowa State Singers	1
MUSIC 181	Symphony Orchestra	1

## Chamber music ensembles:

MUSIC 113	Jazz Ensemble	1
MUSIC 161	Iowa State Singers	1
MUSIC 301	Opera Studio	1-3
MUSIC 321	Advanced Ensemble	1

## Continuation Examination

To be approved for continuation as a music major on the junior level, and enroll in Music 319, a student must pass a continuation examination taken normally at the end of the fourth semester as a music major. Before taking this examination, the student must complete the requisite forms as well as write an essay including:

1. his/her personal goals
2. a self-assessment of his/her progress thus far
3. an assessment of what he/she expects to accomplish before graduation

The student taking the Continuation Examination performs for a Continuation Examination Committee. Requirements include the performance of three works representing different periods or styles selected by, and studied with, the applied teacher, a self-prepared piece, and sight reading. The student must display acceptable solo ability and performance techniques in at least one of the applied areas. A written evaluation will be given each student following his/her performance.

This evaluation will include a candid assessment of the student's potential to achieve his/her goals. In addition, the student may arrange to meet with members of the Continuation Examination Committee at a later date to discuss the results of his/her Continuation Examination. See Piano Proficiency below. For details and forms go to: <http://www.music.iastate.edu>

## Piano Proficiency Requirement

All music majors must demonstrate proficiency in functional skills at the piano. Keyboard music majors (students whose primary instrument is piano or organ) accomplish this through courses in their curricula. All other students accomplish this by satisfactorily completing Music 228. All entering non-keyboard music majors with previous piano experience meet with the class piano instructor, usually the week before classes start in the fall semester, to determine the appropriate piano class (127, 128, 227, 228) for their initial piano enrollment. Some

students are deemed to have met the piano proficiency at this time. Non-keyboard music majors with no previous piano experience should enroll in Music 127, Class Piano I. Continuous enrollment in piano classes is REQUIRED until successful completion of the piano proficiency requirement. **Important:** The piano proficiency must be met, either through completion of Music 228 or demonstration of proficiency, to pass the continuation examination. Failure to do so could delay a student's graduation. All students must fulfill the piano proficiency requirement in order to pass the continuation examination and enroll in Music 319.

## Graduation Proficiency

To be recommended for graduation, a music student should demonstrate to the music faculty mature acquaintance with performance styles, technique, and repertoire. All music majors will participate in departmental recitals to the satisfaction of the department. Candidates for the bachelor of music degree will present a graduation recital.

**\* According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250 (or ENGL 250H). In addition the Communication Proficiency must be certified through one of the following options:**

1. Certification of writing skills, by the instructor, after completion of one of the following:

MUSIC 120	Introduction to Music Literature and Styles	3
MUSIC 383	History of Music I	3
MUSIC 384	History of Music II	3
MUSIC 472	History of American Music	3
MUSIC 473	Topics in Advanced Music History	3
MUSIC 475	Music of the Romantic Era	3
MUSIC 476	Music of the Twentieth Century	3

(Passing one of these courses does not automatically satisfy the requirements for Communication Proficiency.)

2. Satisfactory completion of an advanced writing course:

ENGL 302	Business Communication	3
ENGL 305	Creative Writing: Nonfiction	3
ENGL 314	Technical Communication	3

Music, B.A.  
 B.Mus. - Organ  
 B.Mus. - Piano  
 B.Mus. - Strings  
 B.Mus. - Wind or Percussion Instrument  
 B.Mus. - Instrumental Education K-12  
 B.Mus. - Voice  
 B.Mus. - Vocal Education K-12  
 B.Mus. - Composition

### Music, B.A.

#### Freshman

Fall	Credits Spring	Credits
MUSIC 119	2 MUSIC 119	2
MUSIC 127 <sup>1</sup>	1 MUSIC 120	3
MUSIC 224	4 MUSIC 128	1
MUSIC 225	1 MUSIC 234	3
Music ensemble <sup>2</sup>	1 MUSIC 235	1
ENGL 150	3 Music ensemble <sup>3</sup>	1
LIB 160	1 Arts & Humanities	3
MATH	3	
	<b>16</b>	<b>14</b>

#### Sophomore

Fall	Credits Spring	Credits
MUSIC 219	2 MUSIC 219	2
MUSIC 227 <sup>1</sup>	1 MUSIC 228 <sup>1</sup>	1
MUSIC 334	3 MUSIC 344	3
MUSIC 335	1 MUSIC 345	1
MUSIC 383	3 MUSIC 384	3
Music: ensemble <sup>2</sup>	1 Music: Ensemble <sup>2</sup>	1
ENGL 250	3 Social Science	3
	Elective	2
	(Continuation Examination)	
	<b>14</b>	<b>16</b>

#### Junior

Fall	Credits Spring	Credits
MUSIC 319	2 World Language/Elective	4
Music Elective	3 Arts & Humanities	3
World Language/Elective	4 Natural Science	3
Natural Science	3 Electives	6
Social Science	3 LAS 203	1
	<b>15</b>	<b>17</b>

#### Senior

Fall	Credits Spring	Credits
Music Elective	1 Natural Science	2

Arts & Humanities	3 Electives	12
Social Science	3	
Electives	9	
	<b>16</b>	<b>14</b>

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses. Students with a concentration in piano or organ do not take Class Study in Piano. Students not required to take four semesters of class piano will take additional music elective credits.

<sup>2</sup> Four credits chosen from the following ensembles are required: 111, 113, 115, 141, 151, 161, 191, 321.

<sup>3</sup> ENGL 150 recommends concurrent enrollment in LIB 160.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level.** The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) The courses taken to meet these requirements may also be used to meet other requirements.

Scheduling of the general education requirements where specific courses are not indicated can be flexible. Music courses are best kept in the order/semesters indicated. (Most music courses are offered one semester each year.)

### Music, B.Mus. - organ

#### Freshman

Fall	Credits Spring	Credits
ENGL 150 <sup>c</sup>	3 Humanities	3
MUSIC 119C	2 Social Science	3
MUSIC 224	4 MUSIC 120	3
MUSIC 225	1 MUSIC 119C	2
Music Ensemble	1 MUSIC 234	3
Math/Natural Science	3 MUSIC 235	1
Social Science	3 Music Ensemble	1
LIB 160	1	
	<b>18</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
MUSIC 219C	2 MUSIC 219C	2
MUSIC 334	3 MUSIC 384	3
MUSIC 335	1 MUSIC 344	3

MUSIC 383	3 MUSIC 345	1
Music Ensemble	1 Music Ensemble	1
Natural Science	3 Humanities	3
ENGL 250	3 General Education Elective	3
	MUSIC 327	2
	(Continuation Examination)	
	<b>16</b>	<b>18</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 119B	1 MUSIC 119B	1
MUSIC 319C	3 MUSIC 319C	3
MUSIC 361	2 MUSIC 415C	2
Music History/Theory - 400 Level*	3 Music Ensemble	1
Music Ensemble	1 World Language/Elective	4
World Language/Elective	4 Math/Natural Science	3
MUSIC 440 (even falls only)	3 LAS 203	1
	<b>17</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 119B	1 MUSIC 119B	1
MUSIC 419C	3 MUSIC 419C	3
Music Elective - 300+ Level	3 Music Ensemble	1
Music Ensemble	1 MUSIC 415C	3
Second World Language	4 Second World Language	4
General Education Elective	2 MUSIC 420	R
MUSIC 440 (even falls only)	3	
	<b>17</b>	<b>12</b>

c ENGL 150 recommends concurrent enrollment in LIB 160.

The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) The courses taken to meet these requirements may also be used to meet other requirements.

**Flexibility in scheduling.** Many general education courses can easily be taken in different semesters than indicated. Music courses are best

kept in the order/semesters indicated. (Most music courses are offered one semester each year.)

\* Some advanced theory and history courses (organ major requires 2 of each) are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog at: <https://www.music.iastate.edu/advising> (<https://www.music.iastate.edu/advising/>).

**Music, B.Mus. - piano**

<b>Freshman</b>	<b>Credits Spring</b>	<b>Credits</b>
<b>Fall</b>		
ENGL 150 <sup>c</sup>	3 Humanities	3
MUSIC 119B	3 MUSIC 119B	3
MUSIC 224	4 MUSIC 234	3
MUSIC 225	1 MUSIC 235	1
Music Ensemble	1 MUSIC 120	3
LIB 160	1 Music Ensemble	1
Math/Natural Science	3	
	<b>16</b>	<b>14</b>

  

<b>Sophomore</b>	<b>Credits Spring</b>	<b>Credits</b>
<b>Fall</b>		
MUSIC 219B	3 MUSIC 219B	3
MUSIC 334	3 MUSIC 344	3
MUSIC 335	1 MUSIC 345	1
MUSIC 383	3 MUSIC 384	3
Music Ensemble	1 Music Ensemble	1
ENGL 250	3 Elective	2
Elective	2 MUSIC 327	2
	MUSIC 321	1
	(Continuation Examination)	
	<b>16</b>	<b>16</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 319B	3 MUSIC 319B	3
MUSIC 321	1 MUSIC 321	1
MUSIC 361	2 MUSIC 415B	3
Music History/Theory - 400 Level	3 Natural Science	3
Music Ensemble	1 Music Ensemble	1
MUSIC 440 (even falls only)	3 World Language/Elective	4
World Language/Elective	4 LAS 203	1
	<b>17</b>	<b>16</b>

<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 321	1 MUSIC 321	1
MUSIC 419B	3 MUSIC 419B	3
Music Ensemble	1 General Education Elective	3
General Education Elective	2 Math/Natural Science	3
MUSIC 440 (even falls only)	3 Humanities	3
Social Science	3 Social Science	3
MUSIC 415B	2 MUSIC 420	R
	<b>15</b>	<b>16</b>

c ENGL 150 recommends concurrent enrollment in LIB 160.

The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) The courses taken to meet these requirements may also be used to meet other requirements.

**Flexibility in scheduling.** Many general education courses can easily be taken in different semesters than indicated. Music courses are best kept in the order/semesters indicated. (Most music courses are offered one semester each year.)

\* Some advanced theory and history courses (piano major requires 1 history, 2 theory) are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog at: <https://www.music.iastate.edu/advising> (<https://www.music.iastate.edu/advising/>).

## Music, B.Mus. - strings

<b>Freshman</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
ENGL 150 <sup>c</sup>	3 Humanities	3
MUSIC 119D	3 MUSIC 181	1
MUSIC 127 <sup>1</sup>	1 MUSIC 119D	3
MUSIC 224	4 MUSIC 120	3
MUSIC 225	1 MUSIC 128 <sup>1</sup>	1
MUSIC 181	1 MUSIC 234	3
Math/Natural Science	3 MUSIC 235	1

<b>Sophomore</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 219D	3 MUSIC 219D	3
MUSIC 227 <sup>1</sup>	1 MUSIC 228 <sup>1</sup>	1
MUSIC 334	3 MUSIC 321D	1
MUSIC 335	1 MUSIC 344	3
MUSIC 383	3 MUSIC 345	1
MUSIC 181	1 MUSIC 384	3
ENGL 250	3 MUSIC 181	1
	Social Science	3
	(Continuation Examination)	
	<b>15</b>	<b>16</b>

<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 321D	1 MUSIC 321D	1
MUSIC 319D	3 MUSIC 319D	3
MUSIC 361	2 MUSIC 181	1
MUSIC 415D	2 World Language/Elective	4
Music History/Theory - 400 Level*	3 Math/Natural Science Choice	3
MUSIC 440 (even falls only)	3 LAS 203	1
MUSIC 181	1	
World Language/Elective	4	
	<b>19</b>	<b>13</b>

<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 321D	1 MUSIC 181	1
MUSIC 419	3 MUSIC 321D	1
MUSIC 181	1 MUSIC 415D	2
Social Science	3 MUSIC 419D	3
Natural Science	3 General Education Elective	3
MUSIC 440 (even falls only)	3 Humanities	3
Elective	2 General Education Elective	2
	MUSIC 420	R
	<b>16</b>	<b>15</b>

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses. Students not required to take four semesters of class piano will take additional music elective credits.

c ENGL 150 recommends concurrent enrollment in LIB 160.

The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html> (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>)) The courses taken to meet these requirements may also be used to meet other requirements.

**Flexibility in scheduling.** Many general education courses can easily be taken in different semesters than indicated. Music courses are best kept in the order/semesters indicated. (Most music courses are offered one semester each year.)

\* Some advanced theory and history courses (string major requires 1 history, 2 theory) are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog at: <https://www.music.iastate.edu/advising> (<https://www.music.iastate.edu/advising/>).

## Music, B.Mus. - wind or percussion instrument

### Freshman

Fall	Credits Spring	Credits
ENGL 150 <sup>c</sup>	3 Arts and Humanites	3
MUSIC 119	3 Music Ensemble	1
MUSIC 127 <sup>1</sup>	1 MUSIC 119	3
MUSIC 224	4 MUSIC 120	3
MUSIC 225	1 MUSIC 128 <sup>1</sup>	1
Music Ensemble	1 MUSIC 234	3
Social Science	3 MUSIC 235	1
LIB 160 <sup>c</sup>	1	
	<b>17</b>	<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
MUSIC 219	3 MUSIC 219	3
MUSIC 227 <sup>1</sup>	1 MUSIC 228 <sup>1</sup>	1
MUSIC 334	3 MUSIC 344	3
MUSIC 335	1 MUSIC 345	1
MUSIC 383	3 MUSIC 384	3
Music Ensemble	1 Music Ensemble	1
ENGL 250	3 General Education Elective (Continuation Examination)	3
	<b>15</b>	<b>15</b>

### Junior

Fall	Credits Spring	Credits
MUSIC 319	3 MUSIC 319	3
MUSIC 361	2 MUSIC 321	1
MUSIC 415 <sup>2</sup>	2 MUSIC 415 <sup>2</sup>	2
Music History/Theory - 400 Level*	3 Music Ensemble	1
Music Ensemble	1 World Language/Elective	4
MUSIC 440 (even falls only)	3 Math/Natural Science	3
World Language/Elective	4 LAS 203	1
	<b>18</b>	<b>15</b>

### Senior

Fall	Credits Spring	Credits
MUSIC 321	1 MUSIC 321	1
MUSIC 419	3 MUSIC 419	3
Music Ensemble	1 Music Elective 300+ Level	3
MUSIC 440	3 Arts & Humanities	3
Elective	2 Math/Natural Science	3
Social Science	3 MUSIC 420	R
Natural Science	3	
General Education Elective	2	
	<b>18</b>	<b>13</b>

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses. Students with a concentration in piano or organ do not take Class Study in Piano. Students not required to take four semesters of class piano will take additional elective credits.

<sup>c</sup> ENGL 150 recommends concurrent enrollment in LIB 160.

The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html> (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>)) The courses taken to meet these requirements may also be used to meet other requirements.

**Flexibility in scheduling.** Many general education courses can easily be taken in different semesters than indicated. Music courses are best kept in the order/semesters indicated. (Most music courses are offered one semester each year.)



\* Some advanced theory and history courses (wind or percussion major requires 1 history, 2 theory) are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog at: <https://www.music.iastate.edu/advising> (<https://www.music.iastate.edu/advising/>) .

## Music, B.Mus. - Instrumental Education K-12

### Freshman

Fall	Credits Spring	Credits
MUSIC 119	2 MUSIC 119	2
MUSIC 127 <sup>1</sup>	1 MUSIC 120	3
MUSIC 224	4 MUSIC 128 <sup>1</sup>	1
MUSIC 225	1 MUSIC 234	3
Ensemble	1 MUSIC 235	1
ENGL 150	3 MUSIC 351/354/355 <sup>**</sup>	1-2
LIB 160	1 MUSIC 358B	R
Gen. Ed. (Humanities)	3 Ensemble	1
Gen. Ed. (Math)	3 PSYCH 230	3
	MUSIC 266 <sup>c</sup>	2
	Apply to Teacher Education Program	
	MUSIC 280K	0.5
	<b>19</b>	<b>17.5-18.5</b>

### Sophomore

Fall	Credits Spring	Credits
MUSIC 219	2 MUSIC 219	2
MUSIC 227	1 MUSIC 228 <sup>1</sup>	1
MUSIC 334	3 MUSIC 344	3
MUSIC 335	1 MUSIC 345	1
MUSIC 350/352/353 <sup>**</sup>	1 MUSIC 351/354/355 <sup>**</sup>	1-2
MUSIC 358B	R MUSIC 358B	R
MUSIC 383	3 MUSIC 384	3
Ensemble	1 Ensemble	1
ENGL 250	3 SP CM 212	3
Natural Science	3 MUSIC 248	2
EDUC 204	3 MUSIC 368 (odd springs) or MUSIC 364 (even springs) or MUSIC 490A (arr.) <sup>++</sup>	1-2
	Continuation Exam	
	<b>21</b>	<b>18-20</b>

### Junior

Fall	Credits Spring	Credits
MUSIC 319	2 MUSIC 319	2

MUSIC 350/353 <sup>**</sup>	1 MUSIC 351/354/355 <sup>**</sup>	1-2
MUSIC 358B	R MUSIC 362B	2
MUSIC 361	2 MUSIC 358B	R
MUSIC 366 <sup>c</sup>	2 MUSIC 480K	1
MUSIC 480K	1 MUSIC 368 (odd springs) or MUSIC 464 (even springs) or MUSIC 490 (arr.) <sup>++</sup>	1-2
Ensemble	1 Ensemble	1
SP ED 401 <sup>c</sup>	3 World Language	4
Natural Science/Math	3 EDUC 406	3
World Language	4 MUSIC 375	1
	LAS 203	1
	<b>19</b>	<b>17-19</b>

### Senior

Fall	Credits Spring	Credits
MUSIC 419	2 MUSIC 417S	8
MUSIC 350/352/353 <sup>**</sup>	1 MUSIC 417R	8
MUSIC 358B	R	
MUSIC 466	2	
Ensemble	1	
PSYCH 333	3	
EDUC 426	3	
MUSIC 480K <sup>c</sup>	2	
Gen. Ed. - Humanities	3	
MUSIC 420	R	
	<b>17</b>	<b>16</b>

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses. Students with a concentration in piano or organ do not take Class Study in Piano.

<sup>\*\*</sup> Students should take the major area (WW or brass) with which they are least familiar first to gain more experience in lab band. However, WW players planning to gain additional skills on a 2nd WW, might choose to take that area first. Non-WW players should take 351 before 352. 358B must be taken concurrently with each tech course (350-355).

<sup>++</sup> Alternate year courses. String players take 490B and 464. WW and brass players take 368 and 464.

<sup>c</sup> These courses which appear in the same semester must be taken concurrently.

The LAS world language requirement must be met. The U.S. diversity and international perspectives requirements are automatically met with courses required for this degree option (EDUC 406 and MUSIC 383).

Many general education and education (EDUC) courses can easily be taken in different semesters than indicated as well as summer. Music courses are best kept in the order/semesters indicated (Most music courses are offered one semester each year).

MUSIC 440 (even falls only)	3 Humanities	3
Second World Language	4 Social Science	3
General Education Elective	2 Second World Language	4
	MUSIC 420	R
	<b>15</b>	<b>16</b>

## Music, B.Mus. - voice

### Freshman

Fall	Credits Spring	Credits
ENGL 150 <sup>c</sup>	3 Humanities	3
MUSIC 119A	2 Social Science	3
MUSIC 127 <sup>1</sup>	1 MUSIC 119A	2
MUSIC 224	4 MUSIC 120	3
MUSIC 225	1 MUSIC 128 <sup>1</sup>	1
Music Ensemble	1 MUSIC 234	3
Math/Natural Science	3 MUSIC 235	1
LIB 160	1 Music Ensemble	1
	<b>16</b>	<b>17</b>

### Sophomore

Fall	Credits Spring	Credits
MUSIC 219A	2 MUSIC 219A	2
MUSIC 227 <sup>1</sup>	1 MUSIC 228 <sup>1</sup>	1
MUSIC 334	3 MUSIC 344	3
MUSIC 335	1 MUSIC 345	1
MUSIC 383	3 MUSIC 384	3
Music Ensemble	1 Music Ensemble	1
Natural Science	3 General Education Elective	3
ENGL 250	3 (Continuation Examination)	
	<b>17</b>	<b>14</b>

### Junior

Fall	Credits Spring	Credits
MUSIC 319A	3 MUSIC 319A	3
MUSIC 324 or 415A <sup>2</sup>	2 MUSIC 325 or 360 <sup>2</sup>	2
MUSIC 361	2 MUSIC 327	2
Music History - 400 Level	3 Music Ensemble	1
MUSIC 440 (even falls only)	3 World Language/Elective	4
Music Ensemble	1 Math/Natural Science	3
World Language/Elective	4 LAS 203	1
	<b>18</b>	<b>16</b>

### Senior

Fall	Credits Spring	Credits
MUSIC 419A	3 MUSIC 419A	3
MUSIC 415A or 324 <sup>2</sup>	2 MUSIC 360 or 325 <sup>2</sup>	2
Music Ensemble	1 Music Ensemble	1

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses.

<sup>2</sup> MUSIC 324 alternate Fall (even numbered years) / MUSIC 325 alternate Spring (odd number years – same academic year; MUSIC 360 alternate Spring (even numbered years) when 325 is not taught.

<sup>c</sup> ENGL 150 recommends concurrent enrollment in LIB 160.

The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) The courses taken to meet these requirements may also be used to meet other requirements.

**Flexibility in scheduling.** Many general education courses can easily be taken in different semesters than indicated. Music courses are best kept in the order/semesters indicated. (Most music courses are offered one semester each year.)

\* Some advanced theory and history courses (voice major requires 1 history, 2 theory) are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog at: <https://www.music.iastate.edu/advising> (<https://www.music.iastate.edu/advising/>).

## Music, B.Mus. - Vocal Education K-12

### Freshman

Fall	Credits Spring	Credits
MUSIC 119	2 MUSIC 119	2
MUSIC 127 <sup>1</sup>	1 MUSIC 120	3
MUSIC 224	4 MUSIC 128 <sup>1</sup>	1
MUSIC 225	1 MUSIC 234	3
Choral Ensemble	1 MUSIC 235	1
MUSIC 358A <sup>2</sup>	R Choral Ensemble	1
ENGL 150	3 MUSIC 358A <sup>2</sup>	R
Humanities	3 SP CM 212 <sup>c</sup>	3
Math course	3 MUSIC 266 <sup>c</sup>	2



LIB 160	1	
	<b>17</b>	<b>15</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 219	2 MUSIC 219	2
MUSIC 227	1 MUSIC 228	1
MUSIC 383	3 MUSIC 344	3
MUSIC 334	3 MUSIC 345	1
MUSIC 335	1 MUSIC 384	3
Music Ensemble	1 Music Ensemble	1
MUSIC 290C	1 MUSIC 290C	1
ENGL 250	3 MUSIC 246	2
	General Education Elective	3
	Continuation Examination	R
	<b>15</b>	<b>17</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 319	1 MUSIC 319	1
MUSIC 361	2 MUSIC 362A or 362B	2
Music History - 400 Level	3 Music Ensemble	1
Music Theory - 400 Level	3 MUSIC 490C	3
Music Ensemble	1 Math/Natural Science	3
MUSIC 490C	2 World Language Elective	4
World Language Elective	4 LAS 203	1
	<b>16</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
MUSIC 419	1 MUSIC 419	1
Music Theory - 400 Level	3 Music ensemble	1
Music Ensemble	1 Natural Science	3
MUSIC 490C	3 MUSIC 490C	4
Humanities	3 MUSIC 362A or 362B	2
Social Science	3 Humanities	3
General Education Elective	2 MUSIC 420	R
	<b>16</b>	<b>14</b>

Some advanced theory and history courses are not offered every semester. Semesters of offerings are listed in the course descriptions in the catalog. The BM in composition requires one advanced history course (3 cr.) and 9 credits of advanced theory from the following courses: 346, 440, 446, 490B, 590I. Advanced theory courses must include 346 or 446.

\* The BM degree requires a minimum of 124.5 credits, **including a minimum of 45 credits at the 300/400 level**. The LAS World Language requirements must be met. Courses which may be used for the General Education Requirements can be found at: (<https://las.iastate.edu/students/academics/general-education/>) All ISU students must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives (which is satisfied with MUSIC 383). A list of approved courses can be found at: (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) The courses taken to meet these requirements may also be used to meet other requirements.

## Minor in Music

Candidates for the minor in music will complete 15 credits in music including:

MUSIC 101	Fundamentals of Music	2
or MUSIC 224	Music Theory I	
Three of the following		9
MUSIC 102	Introduction to Music Listening	
MUSIC 120	Introduction to Music Literature and Styles	
or MUSIC 30	Masterpieces of Music and Art in Western Culture.	
MUSIC 304	History of American Rock 'n' Roll	
MUSIC 383	History of Music I	
4 credits chosen from the following		4
MUSIC 111	Wind Ensemble	
MUSIC 113	Jazz Ensemble	
MUSIC 114A	Marching and Pep Bands: Marching Band	
MUSIC 114B	Marching and Pep Bands: Pep Band	
MUSIC 115	Symphonic Band	
MUSIC 141	Lyrca Ensemble	
MUSIC 151	University Chorus	
MUSIC 161	Iowa State Singers	
MUSIC 181	Symphony Orchestra	
MUSIC 301	Opera Studio	
MUSIC 321	Advanced Ensemble	
MUSIC 118	Applied Music: Non-majors	

<sup>1</sup> A placement examination in keyboard skills determines the student's placement in the Class Study in Piano courses. Students with a concentration in piano or organ do not take Class Study in Piano. Students placing out of class piano may need to take additional elective credits to earn the required 124.5 cr. for the BM degree.

<sup>2</sup> ENGL 150 recommends concurrent enrollment in LIB 160.

<sup>3</sup> Alternate year course, taught in odd number years, spring semester.

MUSIC 318	Applied Music: Non-majors
MUSIC 290F	Special Problems: Applied Music

At least 6 of the 15 credits must be in courses numbered 300 and above taken at ISU with a grade of C or better. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

Students pursuing a music minor must meet the audition requirements and/or prerequisites for all courses they wish to take.

MINOR IN MUSIC TECHNOLOGY

Candidates for the minor in music technology will complete 15 credits including:

MUSIC 246	Introduction to Creative Digital Music	2
MUSIC 346	Computer Music Programming Design	3
MUSIC 446	Sound Synthesis Design for Electronic Music	3
7 credits from the following		7
COM S 107	Windows Application Programming	
COM S 207	Fundamentals of Computer Programming or COM S 22 Object-oriented Programming	
COM S 228	Introduction to Data Structures	
COM S 309	Software Development Practices	
COM S 327	Advanced Programming Techniques	
CPR E 329	Software Project Management	
E E 201	Electric Circuits	
E E 224	Signals and Systems I	
E E 324	Signals and Systems II	
M E 451	Engineering Acoustics	
S E 319	Construction of User Interfaces	
MUSIC 101	Fundamentals of Music or MUSIC 10 Basic Musicianship	
MUSIC 102	Introduction to Music Listening	
MUSIC 118	Applied Music: Non-majors	
MUSIC 120	Introduction to Music Literature and Styles or MUSIC 302 Masterpieces of Music and Art in Western Culture.	
MUSIC 224	Music Theory I	
MUSIC 225	Aural Theory I	
MUSIC 234	Music Theory II	
MUSIC 235	Aural Theory II	
MUSIC 290F	Special Problems: Applied Music	
MUSIC 304	History of American Rock 'n' Roll	
MUSIC 318	Applied Music: Non-majors	
MUSIC 383	History of Music I	

MUSIC 384	History of Music II
MUSIC 472	History of American Music
MUSIC 490I	Independent Study: Electronic Music

Total Credits 15

Music courses that may be taken by music majors to meet the requirements for the Music Technology minor are limited to the following:

MUSIC 246	Introduction to Creative Digital Music	2
MUSIC 346	Computer Music Programming Design	3
MUSIC 446	Sound Synthesis Design for Electronic Music	3
MUSIC 490I	Independent Study: Electronic Music	arr †
MUSIC 590I	Special Topics: Electronic Music	arr †

† Arranged with instructor.

At least six of the fifteen credits must be taken at Iowa State University in courses numbered 300 or above with a grade of C or higher. The minor must include at least nine credits not used to meet any other department, college, or university requirement. Students pursuing a minor in music technology must meet the audition requirements and/or prerequisites for all music courses they wish to take.

Naval Science Program

The Department of Naval Science is embedded within the College of Liberal Arts and Sciences as an interdisciplinary program but does not offer an academic degree. The courses offered by the Department are developed by the Department of the Navy. The Naval Science Department and Naval ROTC (NROTC) Program develop individuals mentally, morally, and physically, and imbue in them the highest ideals of duty and loyalty, in order to commission them upon graduation as Navy and Marine Corps officers. Program graduates possess a basic professional background, are motivated towards careers in the Naval Service, and have a potential for future development in mind and character so as to assume the highest responsibilities of command, citizenship, and government. Emphasis is placed on the core values of courage, honor and commitment.

Naval Science courses are open to any ISU student who has met the course prerequisites. To participate in the Naval ROTC Program, students must apply through one of two programs: the NROTC Scholarship Program (full scholarship; which includes a book stipend, tuition, laboratory fees, uniforms, and a monthly stipend), or the College Program (non-scholarship, with limited financial assistance). Applicants for the Scholarship Program are selected through a comprehensive nationwide competition. Applicants for the College Program are selected by the Professor of Naval Science from among students already in attendance

at, or selected for admission by, the university. The College Program involves limited financial assistance by application for a 2 or 3-year scholarship. Upon application, students choose between the Navy Option and Marine Corps Option, for the purposes of training focus. NROTC students pursue their studies like other university students except that they must meet certain additional requirements that will prepare them to serve as naval officers upon graduation.

A Marine Corps Option student incurs a minimum 4-year active duty military obligation as a commissioned officer after graduation; a Navy Option student incurs a minimum 5-year active duty obligation.

Further information is available from the Professor of Naval Science, Iowa State University, [isunrotc@iastate.edu](mailto:isunrotc@iastate.edu), 515-294-6050.

While in the NROTC Program, Scholarship Program students will participate (with pay) in at-sea training cruises during the summer. College Program students, accepted to receive a 2 or 3-year scholarship, will participate in at-sea training during the summer between their Junior and Senior year based on the specifics of their scholarship. Students are also exposed to regular and extracurricular activities that teach leadership principles and help them decide which field of the Navy or Marine Corps they wish to enter. These activities also include weekly leadership laboratory periods and opportunities for involvement in several student societies.

## Undergraduate Study

Naval Science courses are primarily for those students in the NROTC program, however, other university students may also enroll. Students enrolled in the NROTC program must fulfill the following requirements:

N S 111	Introduction to Naval Science	3
N S 212	Seapower and Maritime Affairs	3
N S 220	Leadership and Management	3
N S 230	Navigation	3
N S 320	Naval Ship Systems I (Engineering)	3
N S 330	Naval Ship Systems II (Weapons)	3
N S 410	Naval Operations and Seamanship	3
N S 412	Leadership and Ethics	3
N S 440	Senior Naval Science Seminar	1

Marine option students will complete:

N S 111	Introduction to Naval Science	3
N S 212	Seapower and Maritime Affairs	3
N S 220	Leadership and Management	3
N S 240	Fundamentals of Maneuver Warfare	3
N S 321	Evolution of Warfare	3

N S 412	Leadership and Ethics	3
N S 440	Senior Naval Science Seminar	1

In addition to the normal Naval Science courses, all NROTC students are required to participate in laboratory periods that supplement the various academic courses. The Leadership Lab emphasizes human relations principles, teaches basic military formations, movements, commands, courtesies, and honors, and provides practice in unit leadership. Non NROTC program students enrolled in Naval Science courses are not required to participate in laboratory periods.

## Military Studies Minor

The College of Liberal Arts and Sciences offers a minor in Military Studies. Requirements for the minor include taking a minimum of 15 credits of ROTC instruction, which may be taken from one or more of the ROTC programs. At least six credits must be in courses numbered 300 or above.

## Officer Education Programs

Iowa State University offers Reserve Officers Training Corps (ROTC) programs for the professional training of officers for the Air Force, Army, Navy and Marines.

For specific programs and courses:

- Air Force Aerospace Studies
- Military Science
- Naval Science

The purpose of these programs is to provide an avenue for interested students to become reserve or regular officers in one of the United States military services, and the university regards this training as the foundation for possible careers in the military. The Air Force and the Navy require a period of active duty service upon completion of the ROTC program. Graduates from Army ROTC serve in either active Army, the Army Reserve, or the National Guard.

All students enrolled in advanced ROTC programs receive financial allowances, which are described under Student Financial Aid. Scholarships are also available for all services as outlined in the section on financial aid.

## Philosophy Overview

The philosophy major (33 credits) and minor (15 credits) offer Iowa State University students the opportunity to explore fundamental human questions through reflection and argumentation. Do we have free will? Can machines think? What makes actions right or wrong? What is the nature of knowledge and what can we hope to know? What does justice



require, politically and economically? Philosophy classes explore answers to deep questions such as these, encouraging each student to develop and rationally defend their own views.

Philosophy offers a structured but flexible program to help students graduate on time while pursuing their interests. 200-level courses introduce students to essential questions and methods of philosophical thought. In 300-level courses, students engage in close examination of central topics in both contemporary thought and the history of philosophy. Seminars at the 400-level offer the opportunity to study topics in-depth alongside a committed team of faculty and students.

Philosophy fosters skills of communication and critical thinking that are valuable across work, family, and civic life. The program equips students to logically analyze and develop new responses to the challenges faced by humanity. It also emphasizes clarity of thought and communication as part of rigorous engagement with both abstract and applied areas of thought. These skills of logical analysis, careful reading, original thought, and clear communication are in high demand across different fields of work and post-graduate study. Philosophy majors typically achieve some of the highest scores on standardized tests such as the LSAT and GRE, and have mid-career salaries higher than many other majors.

## Student Learning Outcomes

Upon graduation, students should be able to:

1. Explain central problems in key areas of philosophy, such as metaphysics, epistemology, ethics, logic, political philosophy, philosophy of language, and the philosophy of science.
2. Explain the views of historically important philosophers and place them in the context of significant philosophical movements.
3. Identify and critically evaluate arguments by developing objections and replies.
4. Communicate ideas and arguments, both orally and in writing, with clarity and precision.
5. Engage with different points of view with open-mindedness, intellectual curiosity, and a willingness to learn from the ideas and arguments of others.

## Philosophy Degree Requirements

As majors in the College of Liberal Arts and Sciences, Philosophy students must meet College of Liberal Arts and Sciences and university-wide requirements for graduation in addition to those stated below for the major.

The degree program in philosophy requires a minimum of 33 credits, plus the zero credit PHIL 492 course. The following courses compose the core program of the major from which 15 credits shall be chosen. Additionally,

two courses at the 400 level or above (other than PHIL 490 and PHIL 492) are required.

### Ethical theory: One course required.

PHIL 330	Ethical Theory	3
PHIL 335	Social and Political Philosophy	3
PHIL 535	Contemporary Political Philosophy	3

### History: Two courses required.

PHIL 310	Ancient Philosophy	3
PHIL 314	17th Century Philosophy	3
or PHIL 315	18th Century Philosophy	

### Metaphysics and Epistemology: One course required.

PHIL 364	Metaphysics: God, Minds, and Matter	3
PHIL 366	Truth, Belief, and Reason	3
PHIL 380	Philosophy of Science	3

### Logic: One course required.

PHIL 207	Introduction to Symbolic Logic	3
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Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check <http://www.registrar.iastate.edu/courses/div-ip-guide.html> for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. Three of the required 45 300+ level credits must be earned in a general education group outside the group of the major. You must also complete the LAS world language requirement and LAS career proficiency requirement.

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

## Philosophy, B.A.

### Freshman

Fall	Credits Spring	Credits
PHIL 201	3 Philosophy Choice	3
ENGL 150	3 Social Science Choice	3
LIB 160	1 Humanities Choice	3
Humanities Choice	3 Math Choice	3
Social Science Choice	3 World Language/Elective	4
World Language/Elective	4	
<b>17</b>		<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
PHIL 310	3 PHIL 207	3
ENGL 250	3 PHIL 314 or 315	3
Philosophy Choice	3 Natural Science Choice	4
Humanities Choice	3 Social Science Choice	3
Natural Science Choice	4 Elective	2-3
	LAS 203	1
<b>16</b>		<b>16-17</b>

**Junior**

Fall	Credits Spring	Credits
PHIL 330	3 Philosophy Choice - 300/400 Level	3
PHIL 364 or 380	3 Electives	12
Philosophy Choice	3	
Electives	6	
<b>15</b>		<b>15</b>

**Senior**

Fall	Credits Spring	Credits
Philosophy Choice - 400 Level	3 PHIL 492	R
Philosophy Choice - 300/400 Level	3 Philosophy Choice - 400 Level	3
Electives	6 Electives	10
<b>12</b>		<b>13</b>

**Minor in Philosophy**

The department offers a minor in philosophy which may be earned by completing a total of 15 credits in philosophy. At least 9 credits must be in courses numbered 300 or above (only 3 credits of which may be in PHIL 490). The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

**MINOR IN ETHICS**

The Department Philosophy and Religious Studies offers a minor in ethics. Ethics is the branch of human thought that addresses questions of human morality. It seeks to define right and wrong at the theoretical level and to guide action across diverse fields of practice. An ethics minor provides opportunities for students to develop an understanding of both the theoretical foundations and the practical applications of ethics. It serves students who wish to understand how ethical thought complements their chosen majors, but also students who have an interest in learning about ethics more generally.

The minor in ethics requires 15 credits; at least 6 credits must be in courses numbered 300 or above. The minor must include at least 9

credits that are not used to meet any other department, college or university requirement.

All students pursuing the minor in ethics must complete either PHIL 230 Moral Theory and Practice or PHIL 330 Ethical Theory. In addition, students must complete 6 credits of courses chosen from a list of core ethics courses (Table A below), as well as 6 credits of courses chosen from a broader list of courses with a significant ethics focus (Table A and Table B combined).

**CORE ETHICS COURSES (TABLE A)**

PHIL 230	Moral Theory and Practice	3
PHIL 235	Ethical Issues in a Diverse Society	3
PHIL 320	Existentialism	3
PHIL 330	Ethical Theory	3
PHIL 331	Moral Problems in Medicine	3
PHIL 332	Philosophy of Law	3
PHIL 334	Environmental Ethics	3
PHIL 335	Social and Political Philosophy	3
or PHIL 535	Contemporary Political Philosophy	
PHIL 336	Bioethics and Biotechnology	3
PHIL 343	Philosophy of Technology	3
PHIL 430	Value Theory	3
PHIL 450	Agency and Free Will	3

**ADDITIONAL ETHICS COURSES (TABLE B)**

ACCT 489	Corporate Social Responsibility Reporting	3
A B E 388	Sustainable Engineering and International Development	3
ANTHR 220	Globalization and Sustainability	3
ANTHR 230	Globalization and the Human Condition	3
CPR E 234	Legal, Professional, and Ethical Issues in Cyber Systems	3
ECON 321	Economics of Discrimination	3
ECON 362	Applied Ethics in Agricultural Business	3
EDUC 205	Social Foundations of Education in the United States: Early Childhood and Elementary Education	3
EDUC 405	Social Justice Education and Teaching: Early Childhood and Elementary	3
EDUC 481	Philosophy of Education	3
or EDUC 581	Philosophy of Education	
ENGR 327	Voices of Public Policy	3
ENTSP 410	Social Entrepreneurship	3
GLOBE 220	Globalization and Sustainability	3
JL MC 462	Media Ethics, Freedom, Responsibility	3

MGMT 372	Ethical and Responsible Management	3
NREM 460	Controversies in Natural Resource Management	3
N S 412	Leadership and Ethics	3
PHIL 338	Feminist Philosophy	3
PHIL 339	Liberty and Law in America	3
POL S 235	Introduction to Ethics and Politics	3
POL S 480	Ethics and Public Policy	3
RELIG 360	Religion and Ethics	3
RELIG 370	Religion and Politics	3
RELIG 380	Catholic Social Thought	3
SOC 334	Politics and Society	3
WGS 160	Gender Justice	1

## Philosophy - Graduate Study

The department offers work for a graduate minor in philosophy. For those taking the M.A. or M.S., the minor requirement is two courses above 300 (but not PHIL 490), each taken in conjunction with PHIL 590. For those taking the Ph.D., the requirement is four courses above 300, at least one of which is above 400 (but not PHIL 490), each taken in conjunction with PHIL 590. Interested students should ask the chair to assign a minor advisor.

The department participates in the interdepartmental program in general graduate studies.

## Physics and Astronomy

### The Physics Major

Physics and astronomy are basic natural sciences which attempt to describe and provide an understanding of both our world and our universe. Physics serves as the underpinning of many different disciplines including the other natural sciences and technological areas. Graduates are proficient in the methods of rigorous scientific analysis, relevant mathematical techniques, and modern computational and laboratory methods. They have a broad knowledge of physics, including mechanics, electricity and magnetism, thermodynamics, and modern physics. They are able to communicate clearly and effectively at general and technical levels. They are prepared to pursue a wide range of careers as a professional physicist, astronomer, or science educator. They are also prepared to pursue advanced studies and careers in areas as diverse as engineering, medicine, law, and business administration. Many opportunities exist for students who terminate their studies with a bachelor's degree, especially when combined with technology studies in other areas. Students who meet the necessary scholastic standards often continue their studies in a graduate college, exploring and contributing to new developments in the field.

Faculty have approved a variety of completion pathways for the physics major for students who wish to establish a clear strength in a field of application of physics, such as computer science, science education, mechanical engineering, or even science writing. These pathways make double majors more feasible and are appropriate for students planning to enter the job market with their bachelor's degree.

### Student Learning Outcomes

The expected outcomes for students in the program are:

1. a broad knowledge of physics, including mechanics, electricity and magnetism, thermodynamics, wave motion and modern physics
2. proficiency in laboratory methods
3. proficiency in modern scientific computational methods
4. a sound foundation in the liberal arts including proficiency in communication skills.

## DEGREE REQUIREMENTS

All Physics students complete 49 credits of required classes in Physics and Math and additional credits of Advanced Coursework. For the Advanced Coursework, students choose one of three focus areas selected based on the career goals of the student: Standard Physics, Teacher Preparation, or Physics Applications.

### Physics Core

PHYS 199	Introductory Seminar	1
PHYS 241	Principles and Symmetries in Classical Physics I *	5
PHYS 242	Principles and Symmetries in Classical Physics II *	5
PHYS 321	Introduction to Modern Physics I	3
PHYS 321L	Introductory Laboratory in Modern Physics I	1
PHYS 361	Classical Mechanics	3
PHYS 364	Electricity and Magnetism I	3
PHYS 304	Thermal Physics	3
PHYS 480	Quantum Mechanics I	3

\* PHYS 231/PHYS 231L and PHYS 232/PHYS 232L may be substituted for PHYS 241 and PHYS 242.

**Total Credits** **27**

### Math Core

MATH 165	Calculus I	4
MATH 166	Calculus II	4
MATH 265	Calculus III	4
MATH 267	Elementary Differential Equations and Laplace Transforms	4
MATH 385	Introduction to Partial Differential Equations	3

MATH 207	Matrices and Linear Algebra	3-4
or MATH 317	Theory of Linear Algebra	

All physics majors are encouraged to take STAT 341.

**Total Credits** 22-23

## Advanced Coursework

In addition to the 49 credit core, students choose one of three focus areas: Standard Physics, Teacher Preparation, or Physics Applications.

### Standard Physics Focus

Students with the Standard Physics focus will complete these additional 19 credits.

PHYS 322 & 322L	Introduction to Modern Physics II and Introductory Laboratory in Modern Physics II	4
PHYS 362	Intermediate Mechanics	3
PHYS 365	Electricity and Magnetism II	3
PHYS 310	Electronic Instrumentation for Experimental Physics	4

A minimum of 2 additional lab credits from the following: 2

ASTRO 344L	Astronomy Laboratory	
ASTRO 450L	Undergraduate Research	
PHYS 311	Intermediate Laboratory	
PHYS 311T	Intermediate Laboratory for Secondary Physics Teachers	
PHYS 450L	Undergraduate Research	
PHYS 470L	Applied Physics Laboratory	

And at least 3 credits from: 3

ASTRO 342	Introduction to Solar System Astronomy	
ASTRO 346	Introduction to Astrophysics	
ASTRO 405	Astrophysical Cosmology	
PHYS 421	Ultrafast Laser Science and Spectroscopy	
PHYS 422	Foundations of Quantum Computing	
PHYS 432	Molecular and Cell Biophysics	
PHYS 461	Physics of Biomolecules	
PHYS 481	Quantum Mechanics II *	
PHYS 496	Modern Optics	
PHYS 511	Condensed Matter Physics I	
PHYS 526	Particle and Nuclear Physics	
PHYS 528	Mathematical Methods for the Physical Sciences	
PHYS 531	Statistical Mechanics	
PHYS 534	Symmetry and Group Theory in Physics	
PHYS 541	General Relativity	

\*Students intending to pursue graduate study in physics or astronomy/astrophysics should choose the option PHYS 481 Quantum Mechanics II.

**Total Credits** 19

### Optional Minor

Students completing the Standard Physics Focus who plan to continue their studies in Astronomy and Astrophysics should complete the Astronomy minor by using the following courses. The department has created a sample four-year plan (<https://www.physastro.iastate.edu/undergraduate-programs/>) for those who want to add this minor to their Physics major.

ASTRO 150	Stars, Galaxies, and Cosmology	3
ASTRO 342	Introduction to Solar System Astronomy	3
ASTRO 344L	Astronomy Laboratory (*)	3
ASTRO 346	Introduction to Astrophysics	3
ASTRO 405	Astrophysical Cosmology	3

\*ASTRO 344L can be applied to meet the requirements for the ASTRO Minor and to meet the additional 2 credit lab experience requirement of the major.

**Total Credits** 15

### Teacher Preparation Focus

Students who are preparing to become a teacher meet the advanced coursework requirement of the Physics Major by completing the following 20 credits and meeting the requirements of the Secondary Major in Education. Note: Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

STAT 201	Introduction to Statistical Concepts and Methods	4
PHYS 322	Introduction to Modern Physics II	3
PHYS 311T	Intermediate Laboratory for Secondary Physics Teachers	3
ASTRO 150 or ASTRO 120	Stars, Galaxies, and Cosmology The Sky and the Solar System	3
PHYS 399	Seminar on Secondary School Physics	1-2
EDUC 418	Secondary Science Methods I	3
EDUC 419	Secondary Science Methods II	3

**Total Credits** 20-21

Students who are seeking to add a Math endorsement to their Teacher Preparation program in Physics will also need to complete the following courses in Mathematics.

MATH 397	Teaching Secondary Mathematics Using University Mathematics	3
MATH 497	Teaching Secondary School Mathematics	3
MATH 435	Geometry I	3

**Physics Applications Focus**

Students who are not planning to attend graduate school in Physics or become teachers, can meet the advanced coursework requirements of the Physics major by completing one of several approved completion pathways for the physics major. This coursework can help a Physics graduate establish a clear strength in a field of application of physics, such as computer science, mechanical engineering, data science, or even science writing. These pathways, ranging from 16 to 24 additional credits, also make double majors with physics more feasible. Contact the Physics advisor for further information concerning programs of study in Physics Applications. Sample Physics with applications programs are listed at the department web site (<https://www.physastro.iastate.edu/undergraduate-programs/>).

**Additional Requirements**

As majors in the College of Liberal Arts and Sciences, Physics students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major. This includes meeting the university-wide Communication Proficiency Grade Requirement, by earning credit for ENGL 150, a grade of C or better in ENGL 250 (or ENGL 250H) and a grade of C- or better in ENGL 302, ENGL 305, ENGL 309 or ENGL 314.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language and career proficiency requirements (LAS 203 Professional Career Preparation).

**Physics, B.S**

The plan below is a sample program of study for a student completing the Standard Physics Focus.

**Freshman**

Fall	Credits Spring	Credits
ENGL 150	3 PHYS 242	5
PHYS 199	R MATH 265	4
PHYS 241	5 Social Science Choice	3
MATH 166	4 Natural Science Choice	5
Humanities Choice	3	

LIB 160	1	
	<b>16</b>	<b>17</b>

**Sophomore**

Fall	Credits Spring	Credits
ENGL 250	3 PHYS 361	3
PHYS 321	3 PHYS 322	3
PHYS 321L	1 PHYS 322L	1
MATH 267	4 MATH 385	3
Humanities Choice	3 LAS 203	1
Natural Science Choice	3 Social Science Choice	3
	Humanities Choice	3
	<b>17</b>	<b>17</b>

**Junior**

Fall	Credits Spring	Credits
PHYS 362	3 PHYS 304	3
PHYS 364	3 PHYS 365	3
ENGL 302, 305, 309, or 314	3 Social Science Choice	3
MATH 317 or 207	3-4 Humanites Choice	3
World Language (or Elective)	4-3 World Language (or Elective)	4-3
	<b>16</b>	<b>16-15</b>

**Senior**

Fall	Credits Spring	Credits
PHYS 310	4 PHYS 311 <sup>1</sup>	2
PHYS 480	3 PHYS 481 <sup>2</sup>	3
Elective	3 Elective	3
ASTRO 344L <sup>1</sup>	3 Elective	3
	Elective	3
	<b>13</b>	<b>14</b>

<sup>1</sup> Students must earn a minimum of two laboratory credits from PHYS 311, 311T, 450L, 470L; ASTRO 344L, 450L.

<sup>2</sup> Recommended but not required. Highly recommended for those students planning gradate study.

Four year plans for advanced coursework options to complete the Physics major are listed at <https://www.physastro.iastate.edu/undergraduate-programs> (<https://www.physastro.iastate.edu/undergraduate-programs/>).

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Minor in Physics

The department offers a minor in physics which may be earned by completing 20 credits in physics courses chosen as follows:

PHYS 241	Principles and Symmetries in Classical Physics I *	5
PHYS 242	Principles and Symmetries in Classical Physics II *	5
PHYS 321	Introduction to Modern Physics I	3

### One of the following

PHYS 321L	Introductory Laboratory in Modern Physics I	
PHYS 322L	Introductory Laboratory in Modern Physics II	
PHYS 310	Electronic Instrumentation for Experimental Physics	
PHYS 311	Intermediate Laboratory	
PHYS 311T	Intermediate Laboratory for Secondary Physics Teachers	

### Other acceptable courses

PHYS 304	Thermal Physics	
PHYS 306	Physics of Wave Motion	
PHYS 322	Introduction to Modern Physics II	
PHYS 361	Classical Mechanics	
PHYS 362	Intermediate Mechanics	
PHYS 364	Electricity and Magnetism I	
PHYS 365	Electricity and Magnetism II	
PHYS 421	Ultrafast Laser Science and Spectroscopy	
PHYS 432	Molecular and Cell Biophysics	
PHYS 461	Physics of Biomolecules	
PHYS 480	Quantum Mechanics I	
PHYS 481	Quantum Mechanics II	
PHYS 496	Modern Optics	

\*PHYS 231/231L and PHYS 232/232L may be substituted for PHYS 241 and PHYS 242

## Minor in Astronomy

The department offers a minor in astronomy which may be earned by completing 15 credits as laid out below. 12 or more credits must be at the 300 level or higher. Note that only ASTRO 344L may be used to satisfy both the requirements of a physics major and an astronomy minor.

ASTRO 344L	Astronomy Laboratory	3
ASTRO courses*		9-12
3 credits from the following (if only 9 Astro credits)		3
PHYS 304	Thermal Physics	
PHYS 321	Introduction to Modern Physics I	
PHYS 361	Classical Mechanics	
PHYS 362	Intermediate Mechanics	

PHYS 364	Electricity and Magnetism I	
PHYS 365	Electricity and Magnetism II	
PHYS 480	Quantum Mechanics I	
PHYS 481	Quantum Mechanics II	
PHYS 496	Modern Optics	
AER E 351	Astrodynamics I	

The department has a set of recommended courses for Physics students interested in pursuing graduate school in Astronomy and Astrophysics.

The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

## Graduate Study

The department offers studies for the degrees master of science and doctor of philosophy with majors at both levels in astrophysics, condensed matter physics, high energy physics, nuclear physics, and physics; and minor credit courses for students majoring in other departments.

Facilities of various research groups of the department and the Ames Laboratory are available for research.

Students with bachelor's degrees in physics or astronomy from other institutions ordinarily will qualify for graduate study at Iowa State University provided they have satisfactorily completed course work similar to that suggested for undergraduate majors here intending to go on to graduate school. In some cases, additional instruction at the intermediate level may be required.

Graduates have a broad understanding of physical science, as well as mastery of state-of-the-art methods in their area of specialization. They are able to communicate effectively to a wide range of audiences, from the general public to research colleagues. Their skills in rigorous scientific thinking prepare them for leadership in the broader community. They are skilled in carrying out research, communicating research results, and soliciting research support. They have considerable teaching experience. They have developed problem solving skills that prepare them for careers in either industry or academia.

All candidates for an advanced degree in physics are expected to complete:

PHYS 531	Statistical Mechanics	3
PHYS 564	Advanced Classical Mechanics	3
PHYS 571	Electricity and Magnetism I	3
PHYS 572	Electricity and Magnetism II	3
PHYS 591	Quantum Physics I	4
PHYS 592	Quantum Physics II	4



Candidates for an advanced degree in astrophysics should complete:

PHYS 531	Statistical Mechanics	3
or PHYS 564	Advanced Classical Mechanics	
PHYS 571	Electricity and Magnetism I	3
PHYS 591	Quantum Physics I	4
ASTRO 505	Astrophysical Cosmology	3
ASTRO 510	Observational Astrophysics	3

Astrophysics Ph.D. candidates must take at least three of the 580 level Astro courses, while candidates for the M.S. must take at least two 580 level Astro courses.

A thesis is always required for all Ph.D. majors. The degree master of science is offered both with and without thesis. For all graduate majors the basic requirements for the M.S. are the same: at least 30 credits of acceptable graduate work must be completed, not less than 21 of which must be in physics or astronomy. Students choosing a M.S. degree with thesis may apply up to 8 credits of 699 but no credits of 599 toward the minimum 30 credits. Students choosing a degree without thesis should apply 2 credits of 599, but may not apply any credits of 699, toward the minimum 30 credits.

In addition to course work in the major area of study, all candidates for the Ph.D. degree must complete 9 credits of graduate course work outside this area including at least one 500 or 600 level introductory course in another area of physics. Each candidate for the Ph.D. degree is required to teach one year of elementary physics or astronomy.

Graduate students interested in a physics minor should contact the department for requirements.

## Political Science Overview of Political Science

The study of political science is designed to enable students to understand the nature of politics, public values, and policy, as well as the institutions and processes that produce these outcomes.

Students completing a major in political science will understand and be able to interrelate the leading theories, literature, and approaches in the subfields of American government, political theory, international relations, comparative politics, and public policy. Graduates can analyze and formulate effective argumentation in written and oral forms, with the ability to appreciate and accommodate diverse political ideas and to collect and critique information and ideas of others in support of original arguments. Graduates appreciate the knowledge and civic responsibilities required for effective participation in political life.

The political science major is often chosen by students preparing for a career in law. Students with this goal should consult with the department in selecting courses.

Several internship options are available to the political science major, offering students the opportunity to experience practical application of the knowledge learned in academic courses.

## Expected Student Learning Outcomes

Upon graduation, students should be able to:

- Understand the nature of politics, public values, and the institutions and processes of politics in their various forms.
- Understand and be able to interrelate the leading theories, literature, and approaches in the subfields of American government, political theory and methods, international relations, comparative politics, and public policy.
- Be able to analyze and formulate effective argumentation in written and oral forms, including the ability to appreciate and accommodate diverse political ideas, and to collect and critique information in ideas of others in support of original arguments.
- Appreciate the knowledge and civic responsibilities required for effective participation in political life.

## Political Science, B.A.

All Political Science majors must satisfactorily complete 34 credits of Political Science, including at least 18 credits of Political Science courses numbered 300 or above and at least 9 credits of Political Science courses numbered 400 or above. No more than 3 credits of POL S 490, POL S 496, POL S 497, or POL S 499, alone or in combination, may count towards the major. Only Political Science courses in which a student earns a grade of C- or higher will count for the major. At least 15 credits of Political Science coursework must be earned at Iowa State University.

POL S 101	Exploring Political Science	1
At least two subfield-introduction courses		6
POL S 111	Introduction to American Government	
POL S 121	Introduction to International Politics	
POL S 125	Democracy and Dictatorship: Introduction to Comparative Politics	
At least two vocational gateway courses		6
POL S 222X	Global Engagement	
POL S 232X	Politics of Business	
POL S 235	Introduction to Ethics and Politics	
POL S 271	Public Organizations and Leadership	
POL S 283	Introduction to Environmental Politics and Policies	
At least one research-methods course		3

POL S 261	Thinking Like a Political Scientist: Qualitative Approaches	
POL S 262	Thinking Like a Political Scientist: Quantitative Approaches	
POL S 401	Political Analysis and Research	
Additional POL S 300-level and above coursework to complement other course choices and to meet the minimums required for the major		18
At least 18 credits of POL S courses numbered 300 or above		
At least 9 credits of POL S courses numbered 400 or above		
As part of the 300-level and above coursework, a capstone from at least one of the following:		
POL S 491	Senior Thesis (3 cr. minimum)	
POL S 499	Internship in Political Science (3 cr. minimum)	
POL S course numbered 500 or above (3 cr. minimum)		
Study-abroad experience approved by the department		
POL S 492	Graduating Senior Survey	R
<b>Total Credits</b>		<b>34</b>

#### Complementary Course Requirements

##### One Statistics course

STAT 101	Principles of Statistics	3-4
or STAT 104	Introduction to Statistics	
or STAT 226	Introduction to Business Statistics I	
<b>Total Credits</b>		<b>3-4</b>

##### Communication Proficiency

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGL 302	Business Communication	3
or ENGL 309	Proposal and Report Writing	
or ENGL 314	Technical Communication	
<b>Total Credits</b>		<b>9</b>

As majors in the College of Liberal Arts and Sciences, Political Science students must meet College of Liberal Arts and Sciences (<https://catalog.iastate.edu/collegeofliberalartsandsciences/>) and university-wide requirements (<https://catalog.iastate.edu/collegescurricula/>) for graduation in addition to those stated above for the major. The university-wide Communication Proficiency Grade Requirement requires a grade of C or better in ENGL 250. Students in all ISU majors must also complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with

your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

### Political Science with Teacher Preparation Focus

Students seeking teacher certification in American Government must meet all of the requirements of the Political Science major while taking the specific Political Science classes required for certification by the State of Iowa. This coursework must include POL S 111 Introduction to American Government and a minimum of 12 additional credits in American Government (see options below). Students must also complete at least one additional endorsement in either American History or World History. Most students will complete a total of three endorsement areas; the third might include American or World History, Psychology, Economics, Anthropology or Sociology. Specific requirements of each endorsement are available from your advisor. Teacher license requirements are established by the Iowa Department of Education and the Iowa Board of Educational Examiners and are subject to change. Recent changes may not be reflected in this catalog, but advisers and faculty will be aware.

Students must also meet the requirements of the Secondary Major in Education including student teaching (EDUC 417). Students must earn a minimum grade of B- in all content courses used for licensure and a minimum grade of C in all other required courses.

In addition to completing the requirements of the Secondary Major in Education, students will complete the following:

PSYCH 230	Developmental Psychology	3
EDUC 426	Principles of Secondary Education	3
EDUC/HIST 498	Methods of Teaching History/Social Sciences	

#### Political Science Course Options for American Government Teacher Certification

POL S 111	Introduction to American Government	3
Minimum of 12 additional credits in American Government		12
POL S 121	Introduction to International Politics	
POL S 125	Democracy and Dictatorship: Introduction to Comparative Politics	
POL S 271	Public Organizations and Leadership	
POL S 283	Introduction to Environmental Politics and Policies	
POL S 306	Public Opinion and Voting Behavior	
POL S 310	State and Local Government	
POL S 318	Campaigns and Elections	
POL S 319	Law and Politics	

POL S 320	American Judicial Process
POL S 333	Democracy and Diversity in America
POL S 334	Politics and Society
POL S 335	Science, Technology, and Public Policy
POL S 339	Liberty and Law in America
POL S 344	Public Policy
POL S 358	United States Foreign Policy
POL S 359	Current Issues in American Foreign Policy
POL S 360	American Institutions: Congress
POL S 361	American Institutions: The Presidency
POL S 363	American Institutions: Media
POL S 364	Political Parties and Interest Groups
POL S 370	Religion and Politics
POL S 381	International Political Economy
POL S 385	Women in Politics
POL S 419	The Judiciary
POL S 420	Constitutional Law
POL S 421	Constitutional Freedoms
POL S 430	Foundations of Western Political Thought
POL S 431	Modern Political Thought
POL S 453	International Organization
POL S 460	American Political Institutions

# Four Year Plan

## Political Science, B.A.

Freshman

Fall	Credits	Spring	Credits
POL S 101	1	POL S 121 or 125 <sup>1</sup>	3
ENGL 150	3	Natural Science Choice	3
LIB 160	1	Social Science Choice	3
POL S 111, 121, or 125	3	Humanities Choice	3
Natural Science Choice	3	Elective	3
Social Science Choice	3		
	14		15

Sophomore

Fall	Credits	Spring	Credits
ENGL 250	3	STAT 101, 104, or 226 <sup>2</sup>	3-4
POL S 261 or 262	3	POL S 222X, 232X, 235, 271, or 283	3
POL S 222X, 232X, 235, 271, or 283	3	Political Science Choice - 300/400 Level	3
Natural Science Choice	2-3	Humanities Choice	3
World Language/Elective	3-4	World Language/Elective	3-4

LAS 203	1
	16
	16

Junior

Fall	Credits	Spring	Credits
Political Science Choice - 300/400 Level	6	Political Science Choice - 400 Level	3
ENGL 314, 302, or 309	3	Humanities Choice	3
U.S. Diversity Choice <sup>3</sup>	3	Electives	9
Humanities Choice	3		
	15		15

Senior

Fall	Credits	Spring	Credits
Political Science Choice - 400 Level	3	Political Science Choice - 500 Level	3
Electives	11-12	Electives	12
	14-15		15

Total Credits: 120-121

<sup>1</sup> Meets International Perspectives requirement.
<sup>2</sup> Meets LAS College Mathematical Disciplines requirement.
<sup>3</sup> May be cross-listed to fulfill other requirements. POL S 333, POL S 339, POL S 353, and POL S 385 fill this requirement.

# Minor in Political Science

The department offers a minor in political science that may be earned by completing 15 credits of coursework in political science, fulfilling all of the following criteria:

- At least 9 of the credits must be in courses numbered 300 or above.
- At least 9 of the credits must have been taken at Iowa State University.
- At least 6 of the credits must be in courses numbered 300 or above, be taken at Iowa State University, and have a minimum grade of C.
- No more than 3 credits of POL S 490 may be included.
- None of the credits may be in courses offered only on a satisfactory/fail basis.
- At least 9 of the credits must not be used to meet other department, college, or university requirement.

# BA/MA PROGRAM

The concurrent BA/MA (<https://www.pols.iastate.edu/combined-b-a-m-a/>) classification offers well-qualified Iowa State juniors and seniors the opportunity to start working on a master's degree in Political Science before completing a bachelor's degree. Contact the department's Director of Graduate Education for more information about applying.

## Graduate Study

The department offers work for a Master of Arts degree (MA) with a major in political science and minor for students in other departments. The department also offers work for a Graduate Certificate of Public Management and Policy (GCPMP) for those interested in an educational certificate program that requires less work than a full masters program. In addition, the Department of Political Science offers work for a Master of Science in Information Assurance (MSIA) and a joint Master of Arts/Juris Doctor (MA/JD) program with the Law School of Drake University. Information with detailed requirements for all graduate degrees may be obtained at the department's web page at <https://www.pols.iastate.edu/academics/graduate/>

## Master of Arts (MA)

This is a 30-credit Master's degree that gives students the opportunity to explore the field of political science in order to pursue a PhD, go to law school, improve research skills, or understand politics better. The three concentration areas are American Politics, Global Politics, and Public Policy. Although it is not a formal concentration, some students have worked heavily in the area of political theory. Top students are eligible for graduate assistantships that make graduate study much more affordable and provide opportunities for assisting faculty with teaching and research. These are awarded on a merit basis. The degree can also be pursued jointly with a JD at the Law School of Drake University (see below).

MA graduates have a broad substantive understanding of the political process and the academic study of politics. They also have in-depth knowledge of one or more subfields in political science. Graduates are skilled at conducting research and preparing thorough research summaries. They are able to identify and address complex political questions, taking into account related ethical, legal, economic, and social issues.

The prerequisites for major graduate work in the MA program normally are completion of at least 12 credits in political science or related courses. During their program of study, all students are expected to complete STAT 587, POL S 501, and a thesis or creative component. Additional information including detailed graduation requirements can be found at <https://www.pols.iastate.edu/graduate/political-science-m-a/>.

## Master of Science in Cybersecurity

The Master of Science in Cybersecurity is a multi-disciplinary program designed to provide students with diverse backgrounds and interests the opportunity to obtain professional training in the emerging field of information assurance. The core of the Cybersecurity program is built around a series of courses taught in Electrical and Computer Engineering, Mathematics, and Computer Science that introduce students to software and hardware aspects of cryptography and computer security. The

program also recognizes, however, that information assurance defined in terms of security, privacy, access, and reliability is not simply a technical problem but also involves important societal dimensions, including policy, education, ethics, and management. Recognizing that political science offers many potential intersections with information assurance (e.g., public sector management of information technology; forensics and computer crime; information technology policy and law; information technology and international relations; information warfare; etc.), students with interests in these areas are encouraged to select the Department of Political Science as their home department.

Students opting to pursue a Cybersecurity degree through the Department of Political Science can expect to acquire skills and background knowledge relevant to a career in public policy or public sector management of information assurance technologies. The Cybersecurity degree can also help prepare students who wish to go on to pursue a PhD in information politics and policy.

Students interested in the Cybersecurity degree program should consider Political Science as a home department if their future career and/or educational interests lie in such areas as: institutional issues related to the Internet and information technologies; electronic government and electronic democracy; information technology, international security, and information warfare; information technology policy and law; and public administration and public sector management of information technology.

Admission requirements generally follow the same guidelines as the MA in Political Science. Degree requirements are specified by the Cybersecurity program in cooperation with Political Science. More in-depth information on the program including detailed graduation requirements can be found at <https://www.pols.iastate.edu/graduate/master-of-science-in-information-assurance-ms-ia/>.

## Master of Arts/Juris Doctorate Program (MA/JD)

The Drake Law School and the Department of Political Science at Iowa State University are co-sponsors of the Master of Arts/Juris Doctorate degree. This degree combines courses at both Iowa State University and the Drake Law School and follows most of the same requirements as a double degree. However, the student must have full admission to both schools. Detailed information for the MA/JD can be found at the ISU Political Science webpage as well as the Drake Law School website (under Joint Degree): <http://www.law.drake.edu/> (<http://www.law.drake.edu/>).

The increasing attention being focused on the solution of social problems by state and federal governments has created a need for persons with advanced training in both law and political science. The Drake Law School and the ISU Department of Political Science jointly administer a MA/JD program to provide an opportunity for students at the Drake Law

School to achieve, concurrently, a JD degree in law and a MA degree in political science, and for graduate students in political science at Iowa State University to achieve a degree in law.

Successful completion of this program will enable students at Drake Law School to receive both a JD and an MA degree within a three-year period, while graduate students in political science at Iowa State University will be able to transfer a substantial number of hours to the Drake Law School toward the fulfillment of the JD requirements in a similar amount of time. Additional information including detailed graduation requirements can be found at <https://www.pols.iastate.edu/graduate/master-of-arts-juris-doctorate-program-m-a-j-d/>.

Graduate Minor

Students in other graduate programs may obtain a minor in political science by completing at least 9 credits of political science courses. Interested students should consult the Graduate College Handbook for additional information on graduate minors.

THE GRADUATE CERTIFICATE OF PUBLIC MANAGEMENT AND POLICY (GCPMP)

The Political Science Department offers a Graduate Certificate of Public Management and Policy (GCPMP). The GCPMP is a 15-credit certificate. Students who are interested in public management and policy, but unsure about committing to a full master's degree, can aim for the certificate knowing that those courses will also count toward a master's degree if they choose to continue on. Iowa State graduate students in other fields may want to pursue the certificate to improve their credentials on the job market if their interest overlaps with public management and policy. For example, doctoral students in higher education and education administration can earn all 9 of their "outside" credits in the GCPMP coursework, add the 6 more elective credits, and earn a GCPMP along with their PhD.

Requirements for admission are a graduate school application, an essay stating purposes for study, college transcripts, the GRE (waived for those with five or more years of public or nonprofit sector experience), three letters of recommendation, and the TOEFL for international students. More information on the program including curricular requirements can be found at <https://www.pols.iastate.edu/graduate/graduate-certificate-of-public-management-and-policy/>.

Psychology
Psychology Overview

For college-level requirements in undergraduate curricula leading to the degrees of bachelor of arts and bachelor of science, see College of Liberal Arts and Sciences.

An undergraduate major in psychology provides a liberal arts and science education, which also can serve as preparation for graduate study in psychology, law, or the health professions. The undergraduate major in psychology enables graduates to understand and apply the scientific principles, facts, and basic methods of psychology to their personal and professional activities. Students with a bachelor's degree (B.A./B.S.) in psychology may qualify for a variety of positions including those in social sciences, mental health, corrections, rehabilitation, developmental disability centers, and business (management, insurance, opinion polls). Professional work as a psychologist in academic, business, clinical, government, and school settings requires graduate degrees. Depending on professional goals, a minor in another discipline may be desirable.

Student Learning Outcomes

- Following the recommendations of the American Psychological Association, the undergraduate curriculum in psychology is designed to allow each student to:
1. Develop a detailed knowledge of psychology
  2. Develop an understanding of scientific inquiry and demonstrate critical thinking
  3. Understand the role of ethics and diversity in human behavior
  4. Be able to communicate effectively in the discourse of psychology
  5. Develop skills supporting employment or graduate/professional education

Degree Requirements
COMMUNICATION PROFICIENCY REQUIREMENT

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
or ENGL 250H	Written, Oral, Visual, and Electronic Composition: Honors	

The Department requires a C- or better in one of the following:

PSYCH 302	Research Methods in Psychology	3
ENGL 302	Business Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3

The major must include the following psychology courses each with a minimum grade of C- and an overall average of C or better:

PSYCH 111	Orientation to Psychology	1
or PSYCH 112	Psychology Learning Community Seminar	
PSYCH 101	Introduction to Psychology *	3



PSYCH 211	Career Opportunities in Psychology	1
PSYCH 301	Research Design and Methodology *	3
PSYCH 440	Psychological Measurement I *	3

**The major also must include at least one course from four of the following six areas:**

**Area A**

PSYCH 230	Developmental Psychology	3
PSYCH 335	Child and Adolescent Psychopathology	3

**Area B**

PSYCH 280	Social Psychology	3
PSYCH 380	Social Cognition	3

**Area C**

PSYCH 310	Brain and Behavior	3
PSYCH 315	Drugs and Behavior	3

**Area D**

PSYCH 312	Sensation and Perception	3
PSYCH 313	Learning and Memory	3
PSYCH 316	Cognitive Psychology	3
PSYCH 318	Judgment and Decision Making	3

**Area E**

PSYCH 360	Personality Psychology	3
PSYCH 460	General Psychopathology	3

**Area F**

PSYCH 250	Psychology of the Workplace	3
PSYCH 350	Human Factors in Technology	3

Three additional 3-credit courses in psychology 9

Three additional 3-credit courses in psychology must be taken. Area courses may be used to meet this requirement, but variable credit courses (PSYCH 291, PSYCH 490, PSYCH 491, and PSYCH 492) may not.

In accordance with college requirements, a C or better average is required in the courses used to satisfy the major.

**Departmental requirements for the B.A. and B.S. include the following supporting courses:**

6 credits in Philosophy including 6

PHIL 201	Introduction to Philosophy (not 207)	3
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Two of the following

BIOL 101	Introductory Biology	3
or BIOL 211	Principles of Biology I	
or BIOL 212	Principles of Biology II	

BIOL 155	Human Biology	3
or BIOL 255	Fundamentals of Human Anatomy	

or BIOL 256	Fundamentals of Human Physiology	
CHEM 160	Chemistry in Modern Society	3
or CHEM 163	College Chemistry	
PHYS 101	Physics for the Nonscientist (or higher)	3
STAT 101	Principles of Statistics *	3-4
or STAT 104	Introduction to Statistics	

3 credits in Mathematics from selected course list\*\*

\* minimum grade of C-

\*\* Popular choices include Math 104, Math 140, Math 150, Math 165, and Stat 301. See general education mathematics list for alternative options. Neither Math 105 nor Math 106 may be used to satisfy this requirement.

Students pursuing a B.S. degree also must complete PSYCH 302 Research Methods in Psychology with a minimum grade of C- and a minimum of 10 additional credits from courses listed in the LAS Gen Ed Natural Sciences and Mathematical Disciplines Area as follows: six additional credits in natural sciences, one additional credit in a laboratory course, and three additional credits in mathematics. It should be noted that either Math 104 or Math 150 may be counted toward the B.S. degree requirement, but not both.

Students electing a B.A. degree also must complete an ISU approved minor, certificate or additional major.

As majors in the College of Liberal Arts and Sciences, Psychology students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

## Four Year Plans Psychology, B.A.

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 Psychology Choice *	3
PSYCH 101 <sup>3</sup>	3 Social Science Choice *	3
Required Natural Science *	3 Required Natural Science *	3



Required Math*	3 Arts & Humanities Choice*	3
Social Science Choice*	3 Electives	3
PSYCH 111	1 LIB 160	1
	<b>16</b>	<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
ENGL 250 <sup>2</sup>	3 Psychology Choice*	3
Psychology Choice*	3 Psychology Choice*	3
Arts & Humanities Choice*	3 STAT 101 <sup>3</sup>	4
PHIL 201	3 Minor	3
Required Natural Science*	3 LAS 203	1
PSYCH 211	1	
	<b>16</b>	<b>14</b>

**Junior**

Fall	Credits Spring	Credits
PSYCH 301 <sup>3</sup>	3 PSYCH 302, ENGL 302, ENGL 309, or ENGL 314 <sup>1</sup>	3
Psychology Choice*	3 Minor	3
Philosophy Choice*	3 World Language/Elective	3-4
World Language/Elective	3-4 Elective	6
Minor	3	
	<b>15-16</b>	<b>15-16</b>

**Senior**

Fall	Credits Spring	Credits
PSYCH 440 <sup>3</sup>	3 Psychology Choice	3
Psychology Choice*	3 Minor	3
Minor	3 Electives	7-10
Electives	6	
	<b>15</b>	<b>13-16</b>

**Total Credits: 120-125**<sup>1</sup> Meets English Proficiency Requirement: C- minimum.<sup>2</sup> The university-wide Communication Proficiency Grade Requirement requires a grade of C or better in ENGL 250.<sup>3</sup> Psych Requirement: C- minimum

\* Choose from list of selected courses available from an advisor.

**Psychology, B.S****Freshman**

Fall	Credits Spring	Credits
ENGL 150	3 Psychology Choice*	3
PSYCH 111	1 Social Sciences Choice*	3
PSYCH 101 <sup>3</sup>	3 Required Natural Science*	3

Required Math*	3 Arts & Humanities Choice*	3
Social Sciences Choice*	3 Electives	3
Required Natural Science*	3 LIB 160	1
	<b>16</b>	<b>16</b>

**Sophomore**

Fall	Credits Spring	Credits
ENGL 250 <sup>2</sup>	3 Psychology Choice*	3
Psychology Choice*	3 Psychology Choice*	3
Arts & Humanities Choice*	3 STAT 101 <sup>3</sup>	4
PHIL 201	3 Electives	3
Required Natural Science*	3 LAS 203	1
Required Natural Science Laboratory*	1-2	
PSYCH 211	1	
	<b>17-18</b>	<b>14</b>

**Junior**

Fall	Credits Spring	Credits
PSYCH 301 <sup>3</sup>	3 PSYCH 302 <sup>1</sup>	3
Psychology Choice*	3 Required Math*	3
World Language/Elective	3-4 Required Natural Science*	3
Philosophy Choice*	3 World Language/Elective	3-4
Electives	3 Electives*	3
	<b>15-16</b>	<b>15-16</b>

**Senior**

Fall	Credits Spring	Credits
PSYCH 440 <sup>3</sup>	3 Psychology Choice*	3
Psychology Choice*	3 Electives	10-13
Electives	8	
	<b>14</b>	<b>13-16</b>

**Total Credits: 120-126**<sup>1</sup> Meets English Proficiency Requirement: C- minimum.<sup>2</sup> The university-wide Communication Proficiency Grade Requirement requires a grade of C or better in ENGL 250.<sup>3</sup> Psych Requirement: C- minimum

\* Choose from list of selected courses available from an advisor.

**Psychology Undergraduate Minor**

The department offers a minor in psychology. The minor requires completing 18 credits in psychology, including PSYCH 101 Introduction to Psychology and PSYCH 301 Research Design and Methodology, each with a minimum grade of C-. At least 9 of the 18 credits must be in 300 level courses (or above), but no more than three credits total may be from PSYCH 291 Introductory Research Experience, PSYCH 490 Independent

Study, PSYCH 491 Research Practicum, and PSYCH 492 Fieldwork Practicum. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. In addition to an overall C average or better in courses used to satisfy the minor, a C- or better is required in each course. Contact the psychology advising office for more information.

## Graduate Study

The department offers work for the degree of doctor of philosophy in psychology. A master of science may be earned as part of that degree.

The department offers a doctoral specialization in counseling (<https://counseling.psych.iastate.edu/>) psychology (APA accredited) and doctoral areas of concentration in cognitive (<https://psychology.iastate.edu/graduate-study/doctoral-programs/cognitive-psychology/>) psychology and social (<https://psychology.iastate.edu/graduate-study/doctoral-programs/social-psychology/>) psychology.

A basic goal of graduate study in the Department of Psychology is to provide all students with a broad base of knowledge in psychological science, as well as exposure to the content and methodological skills necessary for effective performance in teaching, research and professional practice. Accordingly, graduates have an extensive knowledge of psychological principles and the conceptual and quantitative skills to conduct psychological research and to communicate the results to the scientific community, students in the classroom, and the general public. Graduates in counseling psychology are skilled in delivering services to diverse clientele in a variety of settings.

The department also participates in the interdepartmental programs in human computer interaction (<http://www.vrac.iastate.edu/hci/>), neuroscience (<http://www.neuroscience.iastate.edu/>) (<http://www.neuroscience.iastate.edu/>) and in the interdepartmental minor in gerontology (<http://www.gerontology.iastate.edu/programs/>).

A formal class and a supervised practicum in the teaching of psychology is recommended for all doctoral students whose future plans may include teaching at the college level. A 12-month internship in a training site or agency approved by the faculty is required of all doctoral students in counseling psychology.

## Public Relations

### PUBLIC RELATIONS

<http://www.greenlee.iastate.edu> (<http://www.greenlee.iastate.edu/>)

The public relations major provides students with the concepts, skills and expertise needed to help organizations build mutually beneficial relationships with diverse publics. The knowledge and tools students develop through the P R curriculum ensure they can enter fields such

as corporate communication, government affairs, and public relations firms. Coursework in this major focuses on writing, research, digital and emerging media, and professional abilities. Students are required to complete a capstone internship experience to practice and refine their skills.

The Greenlee School of Journalism and Communication prepares students for the field of communication. The school offers three majors:

- Advertising Bachelor of Arts (ADVRT)
- Journalism and Mass Communication Bachelor of Science (JL MC)
- Public Relations Bachelor of Science (P R)

In addition, the Greenlee School offers a 4+1 program allowing students to complete their B.A. or B.S. and earn an M.S. in journalism and mass communication in fewer semesters.

Professional skills are taught and practiced alongside academic requirements using the latest technology and leading-edge communication trends and methods.

Founded in 1905, the unit was one of the first journalism programs to be accredited in 1948 and continues to be one of the longest continuously accredited programs in the country. Accreditation is based on the principle that students need a broad-based, liberal arts education and solid core courses within the discipline. Students taking one major at the school may not seek an additional major or minor in the school. All students are required to take an additional major or a minor outside the school as an area of expertise.

## Student Learning Outcomes

Students who major in programs of the Greenlee School of Journalism and Communication are expected to develop competencies in 10 key areas:

- apply the principles and laws of freedom of speech and press, in a global context, and for the country in which the institution that invites ACEJMC is located;
- demonstrate an understanding of the multicultural history and role of professionals and institutions in shaping communications;
- demonstrate culturally proficient communication that empowers those traditionally disenfranchised in society, especially as grounded in race, ethnicity, gender, sexual orientation and ability, domestically and globally, across communication and media contexts;
- present images and information effectively and creatively, using appropriate tools and technologies;
- write correctly and clearly in forms and styles appropriate for the communications professions, audiences and purposes they serve;
- demonstrate an understanding of professional ethical principles and work ethically in pursuit of truth, accuracy, fairness and diversity;

- apply critical thinking skills in conducting research and evaluating information by methods appropriate to the communications professions in which they work;
- effectively and correctly apply basic numerical and statistical concepts;
- critically evaluate their own work and that of others for accuracy and fairness, clarity, appropriate style and grammatical correctness;
- apply tools and technologies appropriate for the communications professions in which they work.

## The Public Relations Major

To receive a bachelor of science degree in public relations, a student must earn at least 120 credits. A minimum of 72 credits must come from courses other than ADVRT, JL MC or P R. At least 50 of these credits must come from the liberal arts and sciences. Overall, at least 45 credits must be from 300-level or above.

The degree requirements allow for a minimum of 34 credits and a maximum of 48 credits to be taken in ADVRT, JL MC and P R. These include:

JL MC 110	Orientation to Journalism and Communication	1
P R 220	Principles of Public Relations	3
JL MC 201	Reporting and Writing for the Mass Media (C+ or better)	3
P R 301	Research and Strategic Planning for Advertising and Public Relations	3
P R 321	Public Relations Writing (C+ or better)	3
300-level ADVRT, JL MC or P R Electives		6
P R 424	Public Relations Campaigns	3
JL MC 460	Law of Mass Communication	3
JL MC 462	Media Ethics, Freedom, Responsibility	3
400-level ADVRT, JL MC, or P R Elective		3
P R 499A	Professional Media Internship: Required	3
<b>Total Credits</b>		<b>34</b>

Public relations majors are also required to take:

STAT 101	Principles of Statistics (or another approved statistics course)	4
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As majors in the College of Liberal Arts and Sciences, public relations students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

**University Requirement:** Students in all ISU majors must complete a three-credit course in U.S. Diversity, as well as a three-credit course in International Perspectives. The approved course lists

are found at the following web addresses:(U.S. Diversity) <http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses> (<http://www.registrar.iastate.edu/students/div-ip-guide/usdiversity-courses/>) and (International Perspectives) <http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current> (<http://www.registrar.iastate.edu/students/div-ip-guide/IntlPerspectives-current/>). Students must also demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

**College of LAS Requirement:** Minimum of 120 credits, including a minimum of 45 credits at the 300-level and above. You must also complete the LAS world language requirement, LAS career proficiency requirement, and any unmet ISU admission requirements.

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

**Minor or Additional Major:** Students are required to fulfill a secondary area of expertise. This requirement can be met by declaring a minor or an additional major outside of the Greenlee School of Journalism and Communication. Students taking one major at the school may not seek an additional major or minor in the school.

Juniors can apply to a concurrent degree program and earn a B.S. in public relations and an M.S. in journalism and mass communication in fewer semesters. Contact the Director of Graduate Education for more information on the Greenlee School's 4+1 Program.

## Public Relations, B.S.

### Freshman

Fall	Credits	Spring	Credits
JL MC 110		1 JL MC 201	3
P R 220		3 STAT 101	4
ENGL 150		3 U.S. Diversity	3
LIB 160		1 Arts & Humanities	3
Arts & Humanities		3 Natural Science	3
Natural Science		3	
<b>14</b>		<b>16</b>	

### Sophomore

Fall	Credits	Spring	Credits
P R 301		3 P R 300-level choice	3

ENGL 250	3 Arts & Humanities	3
Arts & Humanities	3 Social Science	3
Natural Science	2 Social Science	3
World Language or Elective	3-4 World Language or Elective	4
LAS 203	1	

15-16 16

Junior					
Fall	Credits	Spring	Credits	Summer	Credits
P R 321		3 P R 424		3 P R 499A	3
PR/JL MC/ADVRT		3 P R 400-level		3	
300-level Choice		Choice			
Minor/Additional Major Choice		3 International Perspectives		3	
Minor/Additional Major Choice		3 Minor/Additional Major Choice		3	
Elective 300-level		3 Minor/Additional Major Choice 300-level		3	

15 15 3

Senior					
Fall	Credits	Spring	Credits		
JL MC 460		3 JL MC 462		3	
P R/ADVRT/JL MC 400-level Choice		3 ADVRT/JL MC/P R Short Course Intensive		1	
ADVRT/JL MC/P R Short Course Intensive		1 Elective or Minor/Additional Major Choice		3	

Minor/Additional Major Choice 300+	3 Elective or Minor/Additional Major Choice	3
Elective 300-level	3 Elective or Minor/Additional Major Choice 300+	3

13 13

Total Credits: 120-121

## Minor in Public Relations

Students cannot select more than one minor in the Greenlee School of Journalism and Communication. Minors in the Greenlee School are not available to Greenlee majors.

For a minor in public relations, students complete 15 credits including at least 6 credits in the courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

JL MC 101	Mass Media and Society	3
P R 220	Principles of Public Relations	3
9 credits from the following:		9
P R 301	Research and Strategic Planning for Advertising and Public Relations	
P R 305	Publicity Methods	
P R 323X	Strategic Communication in Agriculture and the Environment	
P R 420	Crisis Communication	
JL MC 307	Digital Video Production	
JL MC 390	Professional Skills Development	
JL MC 401	Mass Communication Theory	
JL MC 406	Media Management	
JL MC 474	Communication Technology and Social Change	
JL MC 476	World Communication Systems	
JL MC 477	Diversity in the Media	
P R 497	Special Topics in Communication	

Greenlee majors and minors cannot take ADVRT, JL MC or P R courses pass/not pass.

## Concurrent Undergraduate and Graduate Programs

The Greenlee School offers a 4+1 program allowing students to complete their B.A. or B.S. and earn an M.S. in journalism and mass communication in fewer semesters.

The Greenlee School offers three concurrent degree programs:

B.A. Advertising/M.S. Journalism and Mass Communication

B.S. Journalism/M.S. Journalism and Mass Communication

B.S. Public Relations/M.S. Journalism and Mass Communication

Enrollment in the Greenlee School's concurrent degree programs enables students to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees. See Journalism and Mass Communication Concurrent Undergraduate and Graduate Programs for more information on combining the B.S. in Public Relations and the M.S. in Journalism and Mass Communication.

## GRADUATE PROGRAMS

### Master of Science

The Greenlee School of Journalism and Communication offers work for a Master of Science degree in journalism and mass communication.

### Concurrent Programs

The Greenlee School's concurrent degree programs enable interested students the opportunity to complete coursework for the undergraduate and graduate programs on a five-year accelerated timeline – rather than the typical six-year timeline for the two degrees.

### Graduate Minor

The Greenlee School graduate program offers minor work for students majoring in other departments.

See Journalism and Mass Communication Graduate Programs for more information on the M.S. in Journalism and Mass Communication.

## Religious Studies

The Religious Studies major (27 credits) and minor (15 credits) offer Iowa State University students the opportunity to expand their knowledge about diverse religions in the United States and the world. The major and minor allow students to design their own unique program of study by taking courses that spark their interest. Religious Studies teaches students to explore religion objectively, critically, and empathetically. It equips students to apply academic theories and methods to understand how religions shape and are shaped by history, politics, culture, society, and human psychology. As their religious literacy increases, students will

develop their own ideas about the nature of religion, life's big questions, and the wide range of human ideas, practices, and motivations.

The major in Religious Studies provides both breadth and depth. The program's 200-level courses introduce students to the academic study of religion, providing a foundation that students build on throughout their undergraduate career. In 300-level courses, students closely investigate particular traditions, topics, or themes. Throughout their undergraduate career, students have opportunities to connect their program of study to their own professional and personal goals.

The Religious Studies program provides students skills relevant to building a career based on their interests and passions. Contrary to popular myths, employers in today's modern workplace value college graduates with liberal arts degrees. In Religious Studies, these include the "hard skills" of writing, reading, and conducting organized research. Students also gain so-called "soft skills." These include communication strategies, learning to adapt to new environments, and the capacity to work with and understand people from diverse backgrounds. The flexibility of these skills opens up a wide range of career paths. Religious Studies graduates pursue careers in non-profits, community organizations, and people-focused industries. They apply to graduate and professional schools in areas such as law, education, and ministry. A Religious Studies degree doesn't just help students *get* a job. It helps them advance and grow, both professionally and personally, well into their lives.

### Student Learning Outcomes

Upon graduation, students should be able to:

1. Describe religious diversity in the United States and around the world, including diversity within traditions.
2. Identify key beliefs, doctrines, practices, and expressions of multiple religions.
3. Explain how religion has shaped and been shaped by human history, culture, and society, drawing on historical, cultural, and textual analyses.
4. Distinguish between confessional and academic understandings of religion.
5. Assess data produced by and about religious communities in an objective, critical, and empathetic manner.
6. Create and convey original insights using effective reading, research, writing, and conversation skills.

## Religious Studies - Undergraduate Study

Students pursuing a major in religious studies must complete a minimum of 27 credits, including the requirements below. Students may also choose to do a senior thesis under the supervision of a religious studies

faculty advisor. This option may earn 3-6 credits toward the completion of the major.

Two of the following introductory survey courses of which one must be either 205 or 210 6

RELIG 205	World Religions
or RELIG 210	Religion in America

RELIG 215	Religion and Popular Culture
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RELIG 242	History of Christianity: Early to Medieval
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RELIG 243	History of Christianity: Modern
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RELIG 277	Religion and Society
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Five of the following 300+ level courses 15

RELIG 322	The New Testament
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RELIG 325	Religion, Law, and Justice
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RELIG 328	Native American Religions
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RELIG 332	Catholicism
-----------	-------------

RELIG 334	Africana Religions
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RELIG 336	Religion, Sex and Gender
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RELIG 339	Goddess Religions
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RELIG 340	Magic, Witchcraft, and Religion
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RELIG 348	Psychology of Religion
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RELIG 349	Cognitive Science of Religion
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RELIG 350	Philosophy of Religion
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RELIG 352	Religions of India
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RELIG 358	Islam
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RELIG 359	The Quran
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RELIG 367	Christianity in the Roman Empire
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RELIG 368	Religions of Ancient Greece and Rome
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RELIG 370	Religion and Politics
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RELIG 380	Catholic Social Thought
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RELIG 389	Exhibiting Religion
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Any other RELIG 300- or 400-level course

Minimum of 6 credits of elective Religious Studies courses	6
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<b>Total Credits</b>	<b>27</b>
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Communication Proficiency

ENGL 150	Critical Thinking and Communication	3
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ENGL 250	Written, Oral, Visual, and Electronic Composition	3
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To meet the upper-level ISU Communication requirement, Religious Studies majors choose from one of the following: 0-3

ENGL 302	Business Communication
or ENGL 309	Proposal and Report Writing
or ENGL 314	Technical Communication

or RELIG 322 The New Testament

or RELIG 325 Religion, Law, and Justice

or RELIG 328 Native American Religions

or RELIG 332 Catholicism

or RELIG 352 Religions of India

or RELIG 355 The Quran

or RELIG 389 Exhibiting Religion

<b>Total Credits</b>	<b>6-9</b>
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Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. Students must also complete the LAS College requirements, including the world language requirement and career proficiency requirement.

## Religious Studies, B.A.

### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 Religion Choice 200+ or 300+	3
LIB 160	1 World Language/Elective	4
RELIG 205 or 210	3 Humanities Choice	3
World Language/Elective	4 Social Science Choice	3
Humanities Choice	3 Elective	3
Math Choice	3	
	<b>17</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
Religion Choice 200+ or 300+	3 Religion Choice 300+	3
ENGL 250	3 Natural Science Choice <sup>1</sup>	4
Humanities Choice	3 Social Science Choice	3
Natural Science Choice <sup>1</sup>	4 Humanities Choice	3
Social Science Choice	3 Elective	2-3
	LAS 203	1
	<b>16</b>	<b>16-17</b>



**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Religion Choice 300+	3 Religion Choice 300+	3
Elective	3 Elective	3
Elective	4 Elective	3
Elective	3 Elective	3
Elective	3 Elective	3
<b>16</b>		<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Religion Choice 300+	3 Religion Elective	3
Religion Elective	3 Elective	3
Elective	3 Elective	3
Elective	4 Elective	3
<b>13</b>		<b>12</b>

<sup>1</sup> Laboratory science recommended.

The program offers a minor that may be earned by completing a total of 15 credits in religious studies including either RELIG 205 World Religions or RELIG 210 Religion in America. Nine hours must be in courses at the 300 level or above (no more than 3 hours of seminar and no more than 3 hours of independent study). The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

## Religious Studies - Graduate Study

Religious studies may be one of the three areas used for the interdisciplinary graduate studies master's degree.

## Science Communication Certificate

The science communication certificate provides an opportunity for students to develop their public communication skills, to interface with students and faculty across disciplinary and science-public divides, and to give students an edge in the job market where successful communication with a multitude of stakeholders is essential. As a discipline, science communication brings together theory and practice to communicate scientific information to the public, with an emphasis on two-way and strategic communication with the public.

This certificate is designed to encourage students who are interested in the intersection of science and society to pursue coursework that provides them with the skills to practice public-facing science and effectively engage the public around complex and sometimes controversial scientific topics. In addition, the certificate is designed to

facilitate convergence across disciplines and encourage team-based collaboration at the undergraduate level.

The certificate is open to students of any major, but may be of particular value to students who are planning to pursue science, environmental, health or agricultural communication as a career or students pursuing a career in a science, engineering, math and other technical fields interested in strengthening their communication skills.

## Objectives

- Encourage students to engage with community members, other students and faculty across interdisciplinary boundaries, diverse backgrounds, and divergent interests.
- Prepare students to communicate scientific findings and technological advances in a clear and compelling manner while also encouraging inclusive communication that acknowledges others' values and concerns.
- Cultivate students' understanding of the origins and dynamics of science related controversies and conflicts.
- Challenge students to identify and address scientific misinformation, scientific skepticism, and science denial across social media, blogs, and other social and online networks.
- Prepare students to engage in constructive conversations with diverse audiences over contested science, environmental, health, and agricultural topics.

## Student Learning Outcomes

Students who complete the proposed science communication certificate will be able to:

- Create, co-produce, and evaluate public-facing science communication
- Understand and address the ethical, social, cultural, and historical factors that influence both the public communication of science and the rise and spread of science-related controversies
- Promote public and cross-disciplinary understanding of scientific information
- Co-produce knowledge with community stakeholders through public-facing projects
- Create effective and appropriate science messages across diverse and emergent media platforms, addressed to diverse audiences
- Critically analyze science messages addressed to public audiences around science
- Identify and address misinformation across social media, blogs, and other social and online networks
- Engage in constructive conversations about contested science, environmental, health, and agricultural topics

To prepare students for the challenge of communicating effectively at the intersection of science and society, students will take a core of 12-credits from the Greenlee School of Journalism and Communication, the English Department, and the Department of Philosophy and Religious Studies and 9-credits of electives from three tracks: science in practice, science and society, and communication in practice.

The certificate requires 21 credits, where 9 of the credits taken do not fulfill any other requirements for other majors or general education. Students must complete ENGL 250 before enrolling in the certificate. To successfully complete the certificate, students must submit and receive approval for a final portfolio consisting of a minimum of three applied, public-facing projects developed during or outside of their course work. A cumulative grade point average of at least 2.0 is required in courses taken for the certificate.

### Core Courses (12 credits)

JL MC 260	Media Controversies in Science and Technology	3
PHIL 206	Introduction to Logic and Scientific Reasoning	3
ENGL 312	Communicating Science and Public Engagement	3
JL MC 347	Science Communication	3

### Electives (9 credits)

Students will take one course from each of the three categories of electives: Science in Practice, Science and Society, and Communication in Practice.

- 6 of the 9 credits must be at the 300+ level.
- Students who engage in an internship or research experience (including those connected to courses) may seek approval from the steering committee to have this experience counted as an elective course. This experience must include a public-facing communication/outreach component, and the steering committee will decide which of the 3 categories of electives this experience would fulfill. Students who wish to count the internship toward the certificate must track their hours as well as complete a final paper about their experiences.

#### Science in Practice - select 1 course

BIOL 173	Environmental Biology	3
BIOL 251	Biological Processes in the Environment	3
BIOL 355	Plants and People	3
ENSCI 250	Environmental Geography	3
ENSCI 318	Introduction to Ecosystems	3
ENSCI 360	Environmental Soil Science	3
GEOL 101	Environmental Geology: Earth in Crisis	3
GEOL 102	History of the Earth	3
GEOL 108	Introduction to Oceanography	3
GEOL 160	Water Resources of the World	3

GEOL 201	Geology for Engineers and Environmental Scientists	3
GEOL 324	Energy and the Environment	3
MTEOR 404	Global Change	3
MTEOR 406	World Climates	3
NREM 120	Introduction to Renewable Resources	3
NREM 380	Field Ecology Research and Teaching	3

#### Science and Society - select 1 course

EDUC 347	Nature of Science	3
ENGL 355	Literature and the Environment	3
HIST 362	Global Environmental History	3
HIST 367	America Eats	3
HIST 383	Technology, Public Science, and European Culture, 1715-Present	3
HIST 482	Birth, Death, Medicine, and Disease	3
JL MC 401	Mass Communication Theory	3
JL MC 474	Communication Technology and Social Change	3
JL MC 476	World Communication Systems	3
PHIL 331	Moral Problems in Medicine	3
PHIL 334	Environmental Ethics	3
PHIL 336	Bioethics and Biotechnology	3
PHIL 343	Philosophy of Technology	3
PHIL 380	Philosophy of Science	3
PHIL 389	Philosophy of Psychology and Psychiatry	3
PHIL 485	Philosophy of Physics	3
POL S 283	Introduction to Environmental Politics and Policies	3
POL S 335	Science, Technology, and Public Policy	3
POL S 443	Energy Policy	3
SOC 382	Environmental Sociology	3
SOC 464	Strategies for Community Engagement	3
WGS 307	Women in Science and Engineering	3
WGS 320	Ecofeminism	3
WGS 380	History of Women in Science, Technology, and Medicine	3
WLC 484	Technology, Globalization and Culture	3

#### Communication in Practice - select 1 course

COMST 327	Persuasion and Social Influence	3
COMST 450B	Special Topics in Communication Studies: Health Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3
ENGL 332	Visual Communication of Quantitative Information	3

ENGL 350	Rhetorical Traditions	3
ENGL 411	Technology, Rhetoric, and Professional Communication	3
ENGL 477	Seminar in Technical Communication	3
ENGL 487	Internship in Business, Technical, and Professional Communication	1-3
LING 120	Computers and Language	3
NREM 330	Principles of Interpretation	3
P R 220	Principles of Public Relations	3
P R 305	Publicity Methods	3
P R 323X	Strategic Communication in Agriculture and the Environment	3
SP CM 212	Fundamentals of Public Speaking	3
SP CM 310	Rhetorical Analysis	3

## Sociology

### Undergraduate Study in Sociology

The Department of Sociology offers course work leading to either a bachelor of arts, bachelor of science, or a minor in sociology. Additionally, a bachelor of science in Agricultural & Rural Policy Studies is offered.

### Student Learning Outcomes

Graduates of all these programs will understand and demonstrate:

1. general knowledge of sociology
2. research methods in sociology
3. critical thinking skills
4. application of sociology to pressing social issues
5. sociological and professional values
6. information technology skills
7. communication skills
8. personal and career development

Graduates understand how social institutions, communities, and organizations work and change; they can examine the causes and consequences of conformity, deviance, and inequality. They can apply sociological understanding of human behavior to practical work situations and everyday life. Graduates can read critically, think independently, and communicate effectively about social issues and social policy.

## Degree Requirements

As majors in the College of Liberal Arts and Sciences, Sociology students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

### University Requirements:

International Perspective	3
US Diversity	3

See <http://www.registrar.iastate.edu/courses/div-ip-guide.html> for a list of approved courses.

<b>Total Credits</b>	<b>6</b>
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### Communications:

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3

One of the following	3
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ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
LIB 160	Introduction to College Level Research	1

<b>Total Credits</b>	<b>10</b>
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### World Languages and Culture:

3 years H.S.

SPAN 097	Accelerated Spanish Review	0
2 semesters college		8

<b>Total Credits</b>	<b>8</b>
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### Departmental Requirements for Sociology Majors

A program of study that meets the needs and interests of the student and department requirements will be developed in consultation with the major advisor. Students must maintain a GPA of 2.0 or higher in their core courses. Programs of study will include:

SOC 115	Orientation to Sociology	1
SOC 134	Introduction to Sociology	3
SOC 302	Research Methods for the Social Sciences	3
SOC 401	Contemporary Sociological Theories	3
6 credits of 200+ Sociology courses		6
18 credits of 300+ Sociology courses		18
<b>Total Credits</b>		<b>34</b>

### Bachelor of Arts or Bachelor of Science Degree

In addition to the program of study above, students must select complementary courses that will lead to a bachelor of arts or bachelor of science degree. Programs leading to a bachelor of arts degree will emphasize additional coursework in groups I and III of the general education requirements. Programs leading to a bachelor of science degree will emphasize additional coursework in groups IIA and IIB of the general education requirements. Some of the possible areas of coursework include criminal justice, community (urban and rural)

sociology, family sociology, sociology of work, research methods and statistics, social change and development, social inequality, social psychology and sociological theory.

### Bachelor of Arts complementary coursework:

STAT 101	Principles of Statistics	4
or STAT 104	Introduction to Statistics	
At least 9 additional arts and humanities and/or social science courses		9
LAS approved arts and humanities and/or social sciences courses. General education courses cannot be cross-listed or dual-listed with Sociology courses that count toward the major.		
<b>Total Credits</b>		<b>13</b>

### Bachelor of Science complementary coursework:

STAT 101	Principles of Statistics	4
or STAT 104	Introduction to Statistics	
At least 9 additional credits in natural science, math, or statistics		9
LAS approved mathematics and/or natural science courses. In addition, these courses may be used: STAT 301, STAT 401D, STAT 404, STAT 407, STAT 415, STAT 421, STAT 479; PSYCH 440; HD FS 449; ECON 308, ECON 376; C R P 451 and WGS 402. General education courses cannot be cross-listed or dual-listed with Sociology courses that count toward the major.		
<b>Total Credits</b>		<b>13</b>

LAS majors require a minimum of 120 credits to graduate, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

Majors must complete both ENGL 150 Critical Thinking and Communication and ENGL 250 Written, Oral, Visual, and Electronic Composition. According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250. In addition, majors must also take an advanced course in ENGL 302 Business Communication or ENGL 309 Proposal and Report Writing or ENGL 314 Technical Communication with a grade of C or better.

## Sociology, Bachelor of Arts (BA) and Bachelor of Science (BS)

### Freshman

Fall	Credits Spring	Credits
SOC 115	1 Sociology 200+	3
SOC 134	3 ENGL 250	3
ENGL 150	3 Social Science Choice	3
LIB 160	1 Arts and Humanities Choice	3
Arts and Humanities Choice	3 Arts and Humanities Choice	3
STAT 101 or 104	3-4	
<b>14-15</b>		<b>15</b>

### Sophomore

Fall	Credits Spring	Credits
Sociology 200+	3 Sociology 300+	3
Sociology 300+	3 Sociology 300+	3
World Language/ International Perspectives	3-4 World Language/ International Perspectives	3-4
Arts and Humanities Choice	3 Natural Science Choice	3
Natural Science Choice	3 Elective	3
	LAS 203	1
<b>15-16</b>		<b>16-17</b>

### Junior

Fall	Credits Spring	Credits
Sociology 300+	3 SOC 302	3
U.S. Diversity	3 Sociology 300+	3
Natural Science Choice	2 Complementary Course (approved Arts and Humanities or Social Science course if seeking a BA; approved Math or Natural Science course if seeking a BS)	3
Social Science Choice	3 Electives 300+	6
Electives 300+	6	
<b>17</b>		<b>15</b>

### Senior

Fall	Credits Spring	Credits
SOC 401	3 Sociology 300+	3

ENGL 302, 309, or 314	3 Complementary Course (approved Arts and Humanities or Social Science course if seeking a BA; approved Math or Natural Science course if seeking a BS)	3
Complementary Course (approved Arts and Humanities or Social Science course if seeking a BA; approved Math or Natural Science course if seeking a BS)	3 Electives 300+	6-9
Electives 300+	6	
		<b>15</b>
		<b>12-15</b>

Sociology Minor

The department offers a minor in sociology which may be earned by completing 15 credits in sociology with a minimum 2.0 GPA. At least 9 of the 15 credits must be at the 300 level or higher with a minimum of 6 of those credits taken at ISU. The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

Students are required to earn credit for the following courses:

SOC 134	Introduction to Sociology	3
Additional 12 credits in Sociology courses		12
9 credits must be 300+		
<b>Total Credits</b>		<b>15</b>

Graduate Study

The Department offers study toward the **Master of Science** and **Doctor of Philosophy** degrees, with majors available in **Sociology** and **Rural Sociology**, as well as a graduate minor in **Sociology** for students majoring in other departments. The Department offers concentrations in a number of areas, e.g., community studies and development; sociology of families, inequality, food systems, agriculture and environment; criminal justice/ criminology; methodology; social change and development; and social psychology. The Department of Sociology does not offer a non-thesis option Master’s degree program.

The Department accepts applicants for the PhD program from students who hold a Master’s degree, as well as from students who wish to enter the program directly with a Bachelor’s degree.

Contact information: Kyle Burgason, 202 East Hall, 515-294-9898 or burgason@iastate.edu.

Graduates have a broad understanding of sociology, address complex societal problems, and communicate effectively with scientific colleagues and the general public in both formal and informal settings. They understand sociological theory, conduct research, and are prepared to educate college students and contribute to public policy. Although the Department stipulates no language requirement for either the degree master of science or the degree doctor of philosophy, specifying competence in one or more languages may be desirable in some instances.

The Department also participates in the interdepartmental graduate major in **Sustainable Agriculture**, and the interdepartmental graduate minor in **Gerontology**.

Course requirements are listed below. Information about examinations, theses and dissertations, POS committees and other requirements are available on the Department of Sociology website.

Ph.D. Core Degree Requirements

Although responsibility for determining the student’s course work resides with the Plan of Study (POS) committee, the Department of Sociology outlines core courses that must be taken by all students. A graduate course taken elsewhere can be substituted for the Ph.D. core requirements with approval by the Director of Graduate Education (DOGE) in consultation with the student’s POS committee.

A minimum of 72 semester credits (including master’s degree credits) is required for graduation.

Required Courses for the Ph.D. Degree

STAT 582	Regression for Social and Behavioral Research	3
SOC 506	Classical Sociological Theory	3
SOC 511	Research Methodology for the Social Sciences	3
SOC 512	Applied Multivariate Statistics for Social and Behavioral Research	3
SOC 513	Qualitative Research Methods	3
SOC 534	Race, Class and Gender Inequality	3
SOC 591	Orientation to Sociology	1
SOC 607	Contemporary Sociological Theory	3
SOC 699	Research (minimum 8 credits)	8
14 three-credit elective courses as specified on the POS		42
No more than 12 credits of 590 (special topics) may be applied toward the Ph.D. degree requirements.		
<b>Total Credits</b>		<b>72</b>

## Ph.D. Minor / Co-Major Requirements

### Required Courses for the Ph.D. Minor

SOC 506	Classical Sociological Theory	3
or SOC 607	Contemporary Sociological Theory	
SOC 511	Research Methodology for the Social Sciences	3
One of the following two courses:		
SOC 512	Applied Multivariate Statistics for Social and Behavioral Research	3
or SOC 513	Qualitative Research Methods	
Two 3-credit graduate-level courses in Sociology.		6
<b>Total Credits</b>		<b>15</b>

### Required Courses for the Ph.D. Co-Major

STAT 582	Regression for Social and Behavioral Research	3
SOC 506	Classical Sociological Theory	3
SOC 511	Research Methodology for the Social Sciences	3
One Course in Advanced Methodology:		
SOC 512	Applied Multivariate Statistics for Social and Behavioral Research	
SOC 513	Qualitative Research Methods	
SOC 534	Race, Class and Gender Inequality	3
SOC 591	Orientation to Sociology	1
SOC 607	Contemporary Sociological Theory	3
3 additional three-credit graduate-level courses in Sociology		9
A minimum of 28 total credits is required for the PhD co-major		

### Co-Major Requirements for the Graduate Program in Sustainable Agriculture

The Graduate Program in Sustainable Agriculture (GPSA) develops student competence and expertise in the design, implementation, and evaluation of sustainable agricultural systems. The program's curriculum satisfies the formal requirements for the MS and Ph.D. degrees, as established by the ISU Graduate College, and fosters transdisciplinary and systems-level thinking.

The Department does not offer double majors in sociology.

For admission to the co-major program contact the graduate program coordinator.

## M.S. Core Degree Requirements

Although responsibility for determining the student's course work resides with the POS committee, the Department of Sociology outlines core courses that must be taken by all students. A graduate course taken elsewhere can be substituted for the core requirements with approval by the Director of Graduate Education (DOGE) in consultation with the student's POS Committee.

### Required Courses for the M.S. Degree

STAT 587	Statistical Methods for Research Workers	4
SOC 506	Classical Sociological Theory	3
or SOC 607	Contemporary Sociological Theory	
SOC 511	Research Methodology for the Social Sciences	3
SOC 513	Qualitative Research Methods	3
or STAT 582	Regression for Social and Behavioral Research	
SOC 591	Orientation to Sociology	1
SOC 699	Research	1-8
4 three-credit elective courses as specified on the POS		12
No more than 6 credits of 590 (special topics) may be applied toward the M.S. degree requirements.		
<b>Total Credits</b>		<b>27-34</b>

## M.S. Minor / Co-Major Requirements

### Required Courses for the M.S. Minor

SOC 506	Classical Sociological Theory	3
or SOC 607	Contemporary Sociological Theory	
SOC 511	Research Methodology for the Social Sciences	3
Two 3-credit graduate-level courses in Sociology.		6
<b>Total Credits</b>		<b>12</b>

### Required Courses for the M.S. Co-Major

STAT 587	Statistical Methods for Research Workers	4
SOC 506	Classical Sociological Theory	3
or SOC 607	Contemporary Sociological Theory	
SOC 511	Research Methodology for the Social Sciences	3
One Course in Advanced Methodology:		
STAT 582	Regression for Social and Behavioral Research	3
or SOC 513	Qualitative Research Methods	
SOC 591	Orientation to Sociology	1
2 additional three-credit graduate-level courses in sociology		6
A minimum of 20 total credits is required for the M.S. co-major		

The department does not offer double majors in sociology at the graduate level. Admission requirements to the co-major program are the same as for the major.

### Co-Major Requirements for the Graduate Program in Sustainable Agriculture

The Graduate Program in Sustainable Agriculture (GPSA) develops student competence and expertise in the design, implementation, and evaluation of sustainable agricultural systems. The program's curriculum satisfies the formal requirements for the MS and PhD degrees, as



established by the ISU Graduate College, and fosters transdisciplinary and systems-level thinking.

## Software Engineering

Administered by the College of Engineering and the College of Liberal Arts and Sciences.

For the undergraduate curriculum in Software Engineering (<http://www.se.iastate.edu>) leading to the degree Bachelor of Science. The Software Engineering Program is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

A software engineer uses their expertise to design, develop, and evaluate software, configure and install computer systems, and build and maintain software systems throughout their lifecycle. Specific tasks software engineers perform evolve quickly, reflecting changes in technology, as well as the needs of employers. Software engineers work as members of teams that may include experts in engineering, marketing, manufacturing, accounting, training, and design.

The Software Engineering Program provides undergraduate students with the opportunity to learn Software Engineering fundamentals, to study applications of state-of-the-art software technologies, and to prepare for the practice of Software Engineering. The student-faculty interaction necessary to realize this opportunity occurs within an environment motivated by the principle that excellence in undergraduate education is enhanced by an integrated commitment to successful, long-term research, and outreach programs.

## Student learning outcomes

Graduates of the Software Engineering curriculum should have, at the time of graduation:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

## PROGRAM EDUCATIONAL Objectives

Within five years of graduation, the graduates should:

1. attain a **productive career** in Software Engineering or related fields;
2. attain **leadership** roles and become **effective collaborators** to advance professional and organizational goals;
3. engage in **lifelong learning** and professional development;
4. encourage and support **diversity** and **inclusiveness** in their workplace.

We expect that these objectives will be manifested in our graduates through the following five key attributes: (a) *peer-recognized expertise*, (b) *engagement in professional practice*, (c) *sustained learning*, (d) *leadership* and (e) *teamwork*.

Demonstration of expertise involves applying state-of-the-art practices for solving problems in the design, development, validation, evolution and sustainment of (software) products. Demonstration of professional engagement involves contributing locally and globally to the use of ethical, competent, and creative practices in industry, academia or the public sector. Demonstration of sustained learning involves the ability to adapt to rapid technological, environmental, and organizational changes through self-study and group study and through opportunities of professional development or graduate study. Demonstration of leadership involves the ability to take initiative, and to facilitate the advancements of individuals and the community by influencing others and by having a widespread, positive impact on critical issues and projects. Finally, demonstration of teamwork involves the ability to work with collaborators who have varied expertise, and with diverse cultural and interdisciplinary backgrounds.

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As a complement to the instructional activity, the College of Engineering and the College of Liberal Arts and Sciences provide opportunities for each student to have experience with broadening activities. Students have the opportunity to gain practical industry experience in the cooperative education and internship program. Students have the opportunity to participate in advanced research activities. Through international exchange programs, students learn about engineering practices in other parts of the world.

## Curriculum in Software Engineering

Degree requirements leading to the degree Bachelor of Science in Software Engineering.

### Total credits required: 125 cr.

Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU cumulative GPA, Engineering Basic Program GPA, or Software Engineering Core GPA). See also Engineering Basic Program and Special Programs. Note: Pass/Not Pass credits cannot be used to meet graduation requirements.

International Perspectives: 3 cr. <sup>1</sup>

U.S. Diversity: 3 cr. <sup>1</sup>

### Communication Proficiency/Library requirement:

ENGL 150	Critical Thinking and Communication (C or better in this course)	3
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
LIB 160	Introduction to College Level Research	1
Choose one of the following:		3
ENGL 309	Proposal and Report Writing (C or better in this course)	
ENGL 314	Technical Communication (C or better in this course)	
<b>Total Credits</b>		<b>10</b>

### General Education Requirements: 21 cr. <sup>2</sup>

Choose 1 course from the following:		3
ECON 101	Principles of Microeconomics	
ECON 102	Principles of Macroeconomics	
I E 305	Engineering Economic Analysis	
Approved Arts and Humanities or Social Sciences courses		9
ENGL 250	Written, Oral, Visual, and Electronic Composition (C or better in this course)	3
Choose one of the following ENGL courses (C or better in this course)		3
ENGL 309	Proposal and Report Writing	
ENGL 314	Technical Communication	
SP CM 212	Fundamentals of Public Speaking	3
<b>Total Credits</b>		<b>21</b>

### Engineering Basic Program: 24 cr.

A minimum GPA of 2.00 is required for this set of courses (please note that transfer course grades will not be calculated into the Engineering Basic Program GPA). See Requirement for Entry into Professional Program in College of Engineering Overview section.

CHEM 167	General Chemistry for Engineering Students	4
or CHEM 177	General Chemistry I	
ENGL 150	Critical Thinking and Communication (C or better in this course)	3
S E 101	Software Engineering Orientation <sup>3</sup>	R
S E 185	Problem Solving in Software Engineering <sup>3</sup>	3
LIB 160	Introduction to College Level Research	1
MATH 165	Calculus I	4
MATH 166	Calculus II	4
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1
<b>Total Credits</b>		<b>24</b>

### Math and Physical Science: 17 cr.

COM S 227	Object-oriented Programming (C- or better in this course)	4
COM S 228	Introduction to Data Structures (C- or better in this course)	3
MATH 267	Elementary Differential Equations and Laplace Transforms	4
Math Elective: Choose one of the following:		3
MATH 207	Matrices and Linear Algebra	
MATH 265	Calculus III	
MATH 304	Combinatorics	
MATH 314	Graph Theory	
MATH 317	Theory of Linear Algebra	
STAT 330	Probability and Statistics for Computer Science	3
<b>Total Credits</b>		<b>17</b>

### Software Engineering Core: 37 cr.

A minimum GPA of 2.00 is required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Software Engineering Core GPA):

CPR E 281	Digital Logic	4
Choose one of the following:		3
COM S 327	Advanced Programming Techniques	
CPR E 288	Embedded Systems I: Introduction	
Choose one of the following:		3
COM S 321	Introduction to Computer Architecture and Machine-Level Programming	
CPR E 381	Computer Organization and Assembly Level Programming	
Choose one of the following:		3
COM S 352	Introduction to Operating Systems	

CPR E 308	Operating Systems: Principles and Practice	
Choose one of the following:		3
COM S 230	Discrete Computational Structures	
CPR E 310	Theoretical Foundations of Computer Engineering	
COM S 311	Introduction to the Design and Analysis of Algorithms	3
COM S 363	Introduction to Database Management Systems	3
S E 309	Software Development Practices	3
S E 317	Introduction to Software Testing	3
S E 319	Construction of User Interfaces	3
S E 339	Software Architecture and Design	3
S E 421	Software Analysis and Verification for Safety and Security	3

Note: CPR E 288, CPR E 381, and CPR E 308 are 4-credit courses. The Software Engineering Core credit requirement (37 credits) is given in terms of 3-credit courses. If the 4-credit courses are taken instead, then the extra credits will be used as credits for Supplemental Electives.

**Total Credits** **37**

### Other Remaining Courses: 26 cr.

S E 166	Careers in Software Engineering	R
S E 491	Senior Design Project I and Professionalism	3
S E 492	Senior Design Project II	2
Software Engineering Electives <sup>2</sup>		9
Supplemental Electives <sup>2</sup>		9
Open Elective <sup>2</sup>		3
<b>Total Credits</b>		<b>26</b>

### Optional Co-op/Internships

Co-op (ENGR 398) or internship (ENGR 396) is optional

### Transfer Credit Requirements

The degree program must include a minimum of 30 credits at the 300-level or above in professional and technical courses earned at ISU in order to receive a Bachelor of Science in Software Engineering. These 30 credits must include S E 491 Senior Design Project I and Professionalism and S E 492 Senior Design Project II. The Software Engineering degree program requires a grade of C or better for any transfer credit course that is applied to the degree program.

1. These university requirements will add to the minimum credits of the program unless the university-approved courses are also approved by the department to meet other course requirements within the degree program. U.S Diversity and International Perspectives courses may not be taken Pass/Not Pass.

2. Choose from approved lists (<http://www.se.iastate.edu/academics/>).

3. See Basic Program for Professional Engineering Curricula for accepted substitutions for curriculum designated courses in the Engineering Basic Program.

See also: A 4-year plan of study grid showing course template by semester.

Note: International Perspectives and U.S. Diversity courses are used to meet the General Education Electives (<http://www.se.iastate.edu/academics/>).

Software Engineering, B.S.

#### Freshman

Fall	Credits Spring	Credits
S E 101	R S E 166	R
S E 185	3 COM S 227	4
MATH 165	4 MATH 166	4
CHEM 167 or 177	4 PHYS 231	4
LIB 160	1 PHYS 231L	1
Economics Elective	3 ENGL 150	3
	<b>15</b>	<b>16</b>

#### Sophomore

Fall	Credits Spring	Credits
COM S 228	3 S E 319 <sup>1</sup>	3
CPR E 281 <sup>1</sup>	4 COM S 327 or CPR E 288 <sup>1,2</sup>	3
MATH 267	4 CPR E 310 or COM S 230	3
SP CM 212	3 Math Elective	3
ENGL 250	3 General Education Elective	3
	<b>17</b>	<b>15</b>

#### Junior

Fall	Credits Spring	Credits
S E 309 <sup>1</sup>	3 S E 317 <sup>1</sup>	3
COM S 321 or CPR E 381 <sup>1,2</sup>	3 S E 339 <sup>1</sup>	3
COM S 311	3 COM S 352 or CPR E 308 <sup>1,2</sup>	3
COM S 363 <sup>1</sup>	3 ENGL 314 or 309	3
General Education Elective	3 General Education Elective	3
	<b>15</b>	<b>15</b>

#### Senior

Fall	Credits Spring	Credits
S E 491	3 S E 492	2
S E 421 <sup>1</sup>	3 Software Engineering Elective	3
Software Engineering Elective	3 Software Engineering Elective	3

Supplemental Elective	3 Supplemental Elective	3
STAT 330	3 Supplemental Elective	3
	Open Elective	3
	<b>15</b>	<b>17</b>

**Total Credits: 125**

\* Total credits required - 125 credits. Any transfer credit courses applied to the degree program require a grade of C or better (but will not be calculated into the ISU Cumulative GPA, Engineering Basic Program GPA, or Software Engineering Core GPA). See also Basic Program and Special Programs.

Engineering Basic Program - A minimum GPA of 2.00 is required for this set of courses, including any transfer courses (please note that transfer course grades will not be calculated into the Engineering Basic Program GPA)

Must receive a C or better grade in required English classes.

Must receive a C- or better grade in MATH 165, MATH 166, COM S 227, and COM S 228.

General Educational Elective courses to be selected in consultation with Software Engineering Academic Advisors from a list of approved courses. They must include courses that satisfy university and college general education requirements. These courses include courses or categories of courses such as International Perspectives and U.S. Diversity, World Language, Arts and Humanities, and Social Sciences. Pass/Not Pass credit is not accepted.

Software Engineering Electives and Supplemental Electives must be selected from the program-approved list (<http://www.se.iastate.edu/academics/>).

<sup>1</sup> Software Engineering Core (A minimum GPA of 2.00 is required for this set of courses, including any transfer courses but transfer course grades will not be calculated into the Software Engineering Core GPA)

<sup>2</sup> Students who take the 4-credit lab courses CPR E 288, CPR E 308, and CPR E 381 instead of the corresponding 3-credit alternatives can apply the additional credits toward Supplemental Electives. The total number of credits required in the Software Engineering Program remains the same for all students.

The Software Engineering Program has established concurrent undergraduate and graduate programs with the Department of Computer Science, the Department of Electrical and Computer Engineering, and the Ivy College of Business. Please visit <https://se.iastate.edu/academics/> for details.

## Speech Communication

*The Speech Communication Major will be discontinued Fall 2023 pending Board of Regents State of Iowa approval.*

## Overview

Speech Communication, a major in the Department of English, helps students develop their understanding and appreciation of the human communication process and enhances their oral and written communication practice. Speech Communication students develop an awareness of the importance of oral communication and listening for success in their personal, civic, and professional lives; become familiar with behavioral research in persuasion; understand how language is used to create social change; develop competent delivery skills; assess the quality of arguments; evaluate information found in research and public discourse; and cultivate rhetorical sensitivity in order to better connect with individuals and audiences. In this way, the program contributes to the humanistic, aesthetic, and critical development of liberally educated students in order to prepare them for full and effective participation in society.

## Undergraduate Study

The cross-disciplinary program in speech communication offers courses designed for all students as part of their general education and as a complement to their professional training. It also offers a major or minor in speech communication as well as an additional endorsement for secondary teachers who already have an endorsement in another content area.

Students who major or minor in speech communication will prepare themselves for a wide variety of employment opportunities in business, industry and government, as well as in non-profit and educational organizations. With their effective oral communication, listening, teamwork, problem-solving and leadership skills, speech communication students find positions in general business management: human resources, benefits, financial services, retail, sales and marketing and serve various organizations as recruiters, trainers, promotions managers, communication specialists, community outreach personnel and event planners. The program also prepares students for the study of law, theology, and for graduate level work in speech communication and related disciplines.

The program participates in the interdisciplinary program in Linguistics. Speech Communication also offers a core course and several optional courses in the undergraduate certificate program in Leadership Studies.

## Learning Outcomes

Students who major in Speech Communication will be able to

- understand and apply technical vocabularies, theories, and perspectives to analyze contemporary problems and one's own communication practice.
- speak and listen well and have the self-confidence to become an active leader in communities.

- recognize persuasive strategies, assess reasoning, and perform research in the discipline.

*The Speech Communication Major will be discontinued Fall 2023 pending Board of Regents State of Iowa approval.*

Speech Communication Major

As majors in the College of Liberal Arts and Sciences, Speech Communication students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

A student electing to major in speech communication must earn at least 120 credits with 45 credits at the 300/400 level. A minimum of 33 of those credits must be earned in Speech Communication courses where the student earns a grade of C or better. Our flexible curriculum with few prerequisites can help you meet the 33 hour requirement in a timely way.

Core Requirements (18 credits)

SP CM 110	Listening	3
SP CM 212	Fundamentals of Public Speaking	3
SP CM 216	America Speaks: Great Speakers and Speeches in US History	3
SP CM 310	Rhetorical Analysis	3
COMST 327	Persuasion and Social Influence	3
or SP CM 350	Rhetorical Traditions	
SP CM 497 or SP CM 490		3

Additional Coursework (Choose at least 5 of the following for 15 credits)

ENGL 418	Seminar in Argumentation	3
SP CM 275	Analysis of Popular Culture Texts	3
SP CM 312	Business and Professional Speaking	3
SP CM 323	Gender and Communication	3
SP CM 324	Legal Communication	3
COMST 327	Persuasion and Social Influence	3
SP CM 350	Rhetorical Traditions	3
SP CM 417	Campaign Rhetoric	3

Credits in SP CM 290 Special Projects or SP CM 499 Communication Internship cannot be applied toward the minimum required credits for the major.

The Communication Proficiency requirement may be met by (1) completion of ENGL 150 Critical Thinking and Communication; (2) completion of or credit for ENGL 250 Written, Oral, Visual, and Electronic Composition (or ENGL 250H Written, Oral, Visual, and Electronic Composition: Honors), or its equivalent, with a grade of C or better; (3) one additional writing course beyond ENGL 250 Written, Oral, Visual, and

Electronic Composition with a grade of C or better from the following approved list:

ENGL 302	Business Communication	3
ENGL 303	Free-Lance Writing for Popular Magazines	3
ENGL 304	Creative Writing: Fiction	3
ENGL 305	Creative Writing: Nonfiction	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3
ENGL 415	Business and Technical Editing	3
JL MC 201	Reporting and Writing for the Mass Media	3

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

Speech Communication Education

Students working toward a primary teaching endorsement in another discipline may take coursework toward a speech communication endorsement. Please contact the Iowa State University School of Education's Teacher Education Services.

*The Speech Communication Major will be discontinued Fall 2023 pending Board of Regents State of Iowa approval.*

Speech Communication, B.A.

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 Math Choice	3
SP CM 110	3 Humanities Choice	3
Humanities Choice	3 Natural Science Choice	3
Natural Science Choice	3 Social Science Choice	3
Social Science Choice	3 Elective	3
LIB 160	1	
16		15
Sophomore		
Fall	Credits Spring	Credits
ENGL 250	3 Social Science Choice	3
Humanities Choice	3 World Language/Elective	4-3
Natural Science Choice	3 Humanities Choice	3

SP CM 212	3 Speech Communication Choice	3
World Language/Elective	4-3 Elective	3

**16-15 16-15**

### Junior

Fall	Credits Spring	Credits
COMST 327	3 SP CM 216	3
Speech Communication Choice - 300/400 Level	3 Speech Communication Choice - 300/400 Level	3
Elective - 300/400 Level	3 JL MC 201, ENGL 302, ENGL 303, ENGL 304, ENGL 305, ENGL 309, ENGL 314, or ENGL 315	3
2 Electives - 300/400 Level	6 2 Electives - 300/400 Level	6
<b>15</b>		<b>15</b>

### Senior

Fall	Credits Spring	Credits
Speech Communication Choice	3 Speech Communication Choice 300/400 Level	3
SP CM 310	3 SP CM 497 or SP CM 490	3
2 Electives - 300/400 Level	6 2 Electives - 300/400 Level	6
Elective	3 Elective	3
<b>15</b>		<b>15</b>

### Total Credits: 123-121

Speech Communication choices include SP CM 305, 312, 313, 322, 323, 324, 350 (also ENGL 350), and SP CM 417. Note: Students must earn a C or better in all Speech Communication courses used to meet the 33 credits required for the major.

## Speech Communication Minor

Students from any major can complement their studies with a Speech Communication Minor (<https://engl.iastate.edu/undergraduate-students/minors/#spcm>). The requirements for a minor in speech communication may be fulfilled by credit in SP CM 212 Fundamentals of Public Speaking plus at least 15 additional hours from the lists above, of which 9 credits are in courses numbered 300 or above taken at Iowa State University. The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

## Graduate Study

The program offers courses for a graduate minor in speech communication as well as supporting work for other disciplines. The requirements for a graduate minor (<https://engl.iastate.edu/graduate-students/>) in Speech Communication include:

SP CM 310	Rhetorical Analysis	3
Plus 9 additional hours selected from the following		9
SP CM 323	Gender and Communication	
SP CM 417	Campaign Rhetoric	
SP CM 513	Teaching Fundamentals of Public Speaking	
SP CM 547	The History of Rhetorical Theory from the Classical Era to the Present	
SP CM 548	Cultural and Critical Theories of Communication and Rhetoric	
SP CM 590	Special Topics	
SP CM 592	Core Studies in Rhetoric, Composition, and Professional Communication	

The Program of Speech Communication also participates in the interdepartmental program leading to a master's degree in Interdisciplinary Graduate Studies.

## Statistics Overview of Statistics

The curriculum in liberal arts and sciences with a major in statistics is designed to prepare students for (1) statistics positions in business, industry or commerce, nonprofit institutions, and in state or federal government; and (2) graduate study in statistics. Positions include the following types of work: statistical design, data visualization, analysis and interpretation of experiments and surveys; data processing and analysis using modern computation facilities and statistical computing systems; application of statistical principles and methods in commercial areas such as finance, insurance, industrial research, technology, marketing, manufacturing, sports analytics, quality control, and nonprofit organizations, such as institutions involved in health care or medical research.

Given the application of statistical work to a broad range of fields, students majoring in statistics often obtain at least a minor in a field of application. Some common minors earned by statistics majors are Economics, General Business, and Mathematics. Students preparing for positions in data analysis should consider a minor or certificate in Data Science. Students preparing for a career in the field of actuarial science should consider a certificate in Actuarial Science. Students intending to pursue graduate study in Statistics are strongly advised to complete at least a minor in Mathematics (<https://catalog.iastate.edu/collegeofliberalartsandsciences/mathematics/#undergraduateminortext>) including credit in MATH 414 Analysis I.

Many Statistics majors earn an additional major or degree in a field of application or in Mathematics. Your academic advisor can assist you in developing your course of study including other majors.



## Student Learning Outcomes

Students completing the undergraduate degree in statistics should have a broad understanding of the discipline of statistics. Upon graduation, students should be able to:

- design observational studies and experiments in order to efficiently collect data to help answer questions about science, technology, and society.
- analyze data arising from observational studies and experiments in order to help answer questions about the world around them.
- use modern statistical computing to aid in the collection and analysis of data.
- explain and apply the mathematical and theoretical basis for probability and statistical inference to help answer questions about the world around them.
- effectively communicate statistical findings using oral, visual and written formats.
- effectively respond to ethical issues associated with data collection, data analysis, and communication of statistical findings.

## Undergraduate Major

The requirements for the undergraduate major in statistics are:

STAT 110	Orientation in Statistics	1
STAT 201	Introduction to Statistical Concepts and Methods	4
STAT 301	Intermediate Statistical Concepts and Methods	4
STAT 341	Introduction to the Theory of Probability and Statistics I	4
STAT 342	Introduction to the Theory of Probability and Statistics II	4
STAT 471	Introduction to Experimental Design	3
STAT 475	Introduction to Multivariate Data Analysis	3
STAT 484	Computer Processing of Scientific Data	3
STAT 486	Introduction to Statistical Computing	3

A minimum of 6 credits from the following:

STAT 361	Statistical Quality Assurance
STAT 472	Introduction to Time Series
STAT 473	Introduction to Survey Sampling
STAT 474	Introduction to Bayesian Data Analysis
STAT 476	Introduction to Spatial Data Analysis
STAT 477	Introduction to Categorical Data Analysis
STAT 478	Introduction to Stochastic Process Models
STAT 482	Regression for Social and Behavioral Research
STAT 483	Empirical Methods for the Computational Sciences

Completion of one of the following options:

Option I

MATH 165	Calculus I
MATH 166	Calculus II
MATH 265	Calculus III

Option II

MATH 165	Calculus I
MATH 166H	Calculus II, Honors
MATH 265H	Calculus III, Honors

Credit in one of the following:

MATH 207	Matrices and Linear Algebra
MATH 317	Theory of Linear Algebra

Credit in one of the following:

COM S 127	Introduction to Computer Programming
COM S 207	Fundamentals of Computer Programming
COM S 227	Object-oriented Programming

Credit in one of the following:

COMST 211	Interpersonal Communication
SP CM 212	Fundamentals of Public Speaking

Credit in one of the following (with a grade of C- or higher):

ENGL 302	Business Communication
ENGL 302H	Business Communication: Honors
ENGL 314	Technical Communication
ENGL 314H	Technical Communication: Honors

As majors in the College of Liberal Arts and Sciences, Statistics students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

## Statistics, B.S.

Freshman			
Fall	Credits Spring		Credits
ENGL 150	3 MATH 166 or 166H		4
LIB 160	1 STAT 201		4
STAT 110	1 Social Science Choice		3
MATH 165	4 Humanities Choice		3

Humanities Choice	3	
Natural Science Choice	4	
	<b>16</b>	<b>14</b>

**Sophomore**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
STAT 301	4 STAT 471	3
MATH 265 or 265H	4 MATH 207 or 317	3-4
ENGL 250	3 Computer Science Choice	3
Natural Science Choice	4 Humanities Choice	3
LAS 203	1 Social Science Choice	3
	<b>16</b>	<b>15-16</b>

**Junior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
STAT 341	4 STAT 342	4
STAT 484	3 STAT 486	3
SP CM 212 or COMST 211	3 Social Science Choice	3
World Language/Elective	4 World Language/Elective	4
	Elective	1
	<b>14</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
STAT 475	3 Statistics Choices	6
ENGL 302 or 314	3 Electives	9
Humanities Choice	3	
Electives	6	
	<b>15</b>	<b>15</b>

**Total Credits: 120-121**

## Undergraduate Minor

The department offers a minor in statistics which may be earned by satisfying the following requirements:

- Credit in one introductory level course in statistics, chosen from the following list: STAT 101, STAT 104, STAT 201, STAT 226, STAT 231, STAT 305, STAT 322, STAT 330.
- Credit in one intermediate level course in statistics, chosen from the following list: STAT 301, STAT 326.
- At least 9 additional credits in statistics courses, chosen from the following list: STAT 341, STAT 342, STAT 347, STAT 361, STAT 471, STAT 472, STAT 473, STAT 474, STAT 475, STAT 476, STAT 477, STAT 478, STAT 482, STAT 483, STAT 484, STAT 486.

Courses selected to satisfy the minor must include at least 9 credits that are not used to meet any other department, college or university

requirement other than the credit requirement for graduation and credit requirement for courses numbered 300 or above.

Courses selected to satisfy the minor must include at least 6 credits in courses numbered 300 and above taken at ISU with a grade of C or higher.

## Graduate Study

The department offers graduate programs leading to both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees with a major in statistics. Graduate work leading to a minor in statistics is available for students majoring in other programs, at both the M.S. and Ph.D. levels.

The Ph.D. degree is also offered as a co-major with other graduate programs. The department participates in inter-disciplinary graduate programs in Bioinformatics and Computational Biology, Ecology and Evolutionary Biology, Genetics, Human Computer Interaction, Nutritional Sciences, and Wind Energy Science, Engineering, and Policy.

Graduates of the M.S. program have an understanding of basic statistical theory and methods. Elective courses in the M.S. program provide an opportunity for students to emphasize particular areas of statistical methods or application in their program. Students complete a minimum of 34 semester credits, including work on a capstone project resulting in a written creative component under the direction of an individual major professor and presented in a final oral examination.

Graduates of the Ph.D. program in statistics have studied advanced theory and methods, and have demonstrated the ability to conduct independent research resulting in an original contribution to the discipline. Candidates for the Ph.D. degree in statistics complete a minimum of 72 semester credits, including at least 18 credits given for research activity, pass an oral preliminary examination, and submit a written dissertation containing original research that is defended in a final oral examination. Dissertation research is typically conducted in close collaboration with a major professor and usually results in publishable material. The department does not offer specific program tracks or areas of emphasis, but the diversity of elective courses and research areas of faculty allow students to tailor their individual programs to reflect areas of particular interest.

Graduates of co-major Ph.D. programs in statistics and an applied scientific discipline have mastered basic statistical theory and have studied advanced methodology. Students complete a minimum of 72 semester credits for courses in statistics and the chosen scientific discipline. Students conduct research that is a combination of statistical methodology and the scientific discipline. Co-major professors work with the student to prepare for an oral preliminary examination and conduct research leading to a single dissertation project that produces an original contribution to at least one of the two disciplines that is defended in a final oral examination.

Graduates of co-major Ph.D. programs in statistics and an area of theoretical mathematics have mastered basic statistical methods and have studied advanced statistical theory. Students complete a minimum of 72 semester credits. Co-major professors assist the student in preparing a dissertation that represents original research that makes a contribution at the interface of statistical theory and a sub-discipline of mathematics. The dissertation is defended in a final oral examination.

## Teaching English as a Second Language (TESL) Minor

The Minor in TESL prepares students to teach English to nonnative speakers of English, either in community programs in the United States or in overseas locations. The Minor provides understanding of how languages work (ENGL 219/LING 219) and practical and theoretical applications in how English is taught to those who do not speak English natively (ENGL 322/LING 322, ENGL 324/LING 324, ENGL 325/LING 325, and ENGL 425/LING 425). The TESL Minor prepares students to cross cultural boundaries to learn about, interact with, and assist speakers of other languages in learning English, the leading global language today. A TESL Minor will help students become global citizens through interacting with and teaching those from around the world who come to the United States and by giving students skills that will allow them to live and work in other countries. All classes listed are requirements for the Minor in TESL (15 credits). A C or better is required in each course used to satisfy the minor. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement.

Contact Isabella Perksen [iperksen@iastate.edu](mailto:iperksen@iastate.edu) for more information.

### Requirements

ENGL 219	Introduction to Linguistics	3
LING 322	Language and Society	3
LING 324	Introduction to Teaching ESL Literacy	3
LING 325	Teaching Methods for ESL Learners: Oral Communication Skills	3
ENGL 425	Second Language Learning and Teaching	3

## Technical Communication

The Technical Communication major (and additional major or minor) prepares students for careers that involve information—particularly scientific or technical information. Students learn to write and design workplace texts, including responsive digital content (such as websites). They are taught to make complex scientific, business, and technical content clear and usable for its audiences. Courses emphasize writing, editing, design (print and online), organization, research, critical thinking, and collaboration (especially with subject-matter experts). Some students double major in Technical Communication and a

technical or scientific field; Technical Communication is also often an additional major or minor for students who major in English (<http://catalog.iastate.edu/collegeofliberalartsandsciences/english/>).

## BS in Technical Communication Learning Outcomes

Students who major in Technical Communication will be able to

- compose a wide range of print and online documents for use in business, schools, and communities.
- understand technical and scientific information and strategies for producing texts to communicate that information to others.
- describe and use the theories that assess print and online documents, collaboration, organizational activities, and various technologies.
- demonstrate mastery of concepts from organizational culture and visual communication, including collaborative writing and clear, responsive professional and technical documents.
- identify specific audience needs in rapidly changing digital and print environments.
- identify and create user-friendly interfaces; understand and put into practice strategies to enable the optimal usability of documents.

## Technical Communication Major Requirements

Majors develop advanced skills in multiple aspects of technical communication and apply their knowledge of technical communication to a specific discipline. Technical communication majors must take 33 credits within the major and 6 hours in a designated area of concentration related to science, technology, or design (an acceptable minor will also fulfill this requirement).

ENGL 214	Introduction to Technical Communication	3
ENGL 310	Rhetorical Analysis	3
ENGL 313	Rhetorical Website Design	3
ENGL 314	Technical Communication	3
ENGL 415	Business and Technical Editing	3
ENGL 416	Visual Aspects of Business and Technical Communication	3

Electives: 9 credits (with at least 6 credits from 400 or above courses)

ENGL 220	Descriptive English Grammar
ENGL 302	Business Communication
ENGL 309	Proposal and Report Writing
SP CM 312	Business and Professional Speaking
ENGL 312	Communicating Science and Public Engagement

ENGL 350	Rhetorical Traditions	
ENGL 418	Seminar in Argumentation	
ENGL 477	Seminar in Technical Communication	
ENGL 487	Internship in Business, Technical, and Professional Communication	
ENGL 542	Technical Editing and Publication Management	
ENGL 549	Multimedia and Interaction Design	
Designated Area of Concentration (DAC) in technical, scientific, or design field		6
<b>Total Credits</b>		<b>33</b>

## Technical Communication Major Requirements

Technical Communication majors are required to have, in addition to ISUComm foundation courses (ENGL 150 (<http://catalog.iastate.edu/search/?P=ENGL%20150>) Critical Thinking and Communication and ENGL 250 (<http://catalog.iastate.edu/search/?P=ENGL%20250>) Written, Oral, Visual, and Electronic Composition), at least 33 credits in TComm (including 6 credits in a designated area of concentration). Majors transferring from other institutions must take at least 18 of their credits in TComm while in residence at Iowa State.

To graduate with a major in Technical Communication and meet the university-wide Communication Proficiency Grade Requirement, a student must have credit for ENGL 150 Critical Thinking and Communication and earn at least a C (not C-) in ENGL 250 Written, Oral, Visual, and Electronic Composition as well as in each of the courses taken to fulfill the program of study, including one advanced communication course.

## Designated Area of Concentration Courses

The Designated Area of Concentration (DAC) is a student-designed grouping of related courses in a technical, scientific, or design field that will meet the student's professional or academic interests. Courses for the 6-credit DAC must be taken outside the English Department and approved by the Technical Communication Program Advisor. An additional major or a minor in areas such as computer science, social science, natural science, entrepreneurial studies, design studies, engineering studies, or another technical, scientific, or design field may substitute for the DAC.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check <http://www.registrar.iastate.edu/courses/div-ip-guide.html> for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS world language requirement and career proficiency requirement.

As majors in the College of Liberal Arts and Sciences, Technical Communication students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

## Technical Communication, B.S.

### Freshman

Fall	Credits Spring	Credits
ENGL 150 (or ENGL 250 by placement or transfer credit)	3 Social Science Choice	3
Humanities Choice	3 Natural Science Choice	3
World Language/Elective	4 Humanities Choice	3
MATH or STAT	3 World Language/Elective	4
LIB 160	1 ENGL 250 (if not in Fall); or ENGL 310	3
ENGL 214	3	
	<b>17</b>	<b>16</b>

### Sophomore

Fall	Credits Spring	Credits
ENGL 310, 313, or 250	3 Technical/Scientific/Design Course	3
Social Science Choice	3 ENGL 314	3
U.S. Diversity Choice	3 ENGL 313, 310, or TComm Elective	3
Natural Science Choice	3 Humanities Choice or elective	3
Elective/Minor	3 TComm Elective/Minor	3
LAS 203	1 Natural Science Choice	2
	<b>16</b>	<b>17</b>

### Junior

Fall	Credits Spring	Credits
TComm Choice: ENG 416, 477, or other 400-level TComm course	3 ENGL 415	3
Elective/Minor	3 Minor	3
International Perspectives Choice	3 TComm Elective from List (ENGL 300+)	3
Humanities Choice	3 Technical/Scientific/Design Course	3
Social Science Choice	3 Electives	3
	<b>15</b>	<b>15</b>

**Senior**

<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Technical/Scientific/Design Course	3 ENGL 487 (recommended)	3
TComm Elective from List – ENGL 400+	9 TComm Elective from List – ENGL 400+	3
Electives/Minor	3 Electives or Minor	6
	<b>15</b>	<b>12</b>

Students may double-count some courses to complete the degree requirements in 120 credits.

## Technical Communication Minor Requirements

The department offers a minor in Technical Communication, which students may earn by completing the following:

ENGL 314	Technical Communication	3
Choose 4:		12
ENGL 214	Introduction to Technical Communication	
ENGL 302	Business Communication	
ENGL 309	Proposal and Report Writing	
ENGL 310	Rhetorical Analysis	
ENGL 312	Communicating Science and Public Engagement	
ENGL 313	Rhetorical Website Design	
ENGL 332	Visual Communication of Quantitative Information	
ENGL 350	Rhetorical Traditions	

or with the appropriate prerequisites

ENGL 411	Technology, Rhetoric, and Professional Communication	
ENGL 415	Business and Technical Editing	
ENGL 416	Visual Aspects of Business and Technical Communication	
ENGL 418	Seminar in Argumentation	
ENGL 477	Seminar in Technical Communication	
ENGL 529	Content Management	
ENGL 542	Technical Editing and Publication Management	
ENGL 549	Multimedia and Interaction Design	

**Total Credits** **15**

Nine of the 15 credits must be 300 level or above and students must earn a grade of C (not C-) or higher in each course taken in the minor. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students may design their minor programs around their own interests but are encouraged to work with the Technical Communication Program Advisor.

Note: Students should check the ISU catalog to be sure that they meet prerequisites if they intend to register for 400+ courses.

## Theatre and Performing Arts Overview

[www.music.iastate.edu/theatre](http://www.music.iastate.edu/theatre) (<http://www.music.iastate.edu/theatre/>)

The Theatre and Performing Arts program:

- Utilizes a flexible, interdisciplinary curriculum.
- Focuses on undergraduate experiences, high impact learning, interdisciplinary and cross-community collaboration, and exceptional professional preparation and training.
- Engages in collaborative, innovative practices in both classroom and production settings.
- Empowers students to take an active role in an interconnected system of artistic community engagement and creative momentum.
- Is dedicated to individualized student-centered programming that is ambitious, relevant, and rigorous.

ISU Theatre impacts hundreds of students from majors throughout the university in our classes, productions and studios. Our students are compassionate, enthusiastic, aware, ambitious, dependable, dedicated, disciplined and generous. The Theatre and Performing Arts program offers a wide variety of courses that support the student's individual interests and specialization.

The major in performing arts offers the undergraduate student a cross-disciplinary core including 26 credits in three categories: Theatre, Music and Dance. Students also select a 21-22 credit emphasis in one or more of the following areas of focus:

- Acting/Directing
- Dance
- Musical Theatre
- Theatrical Design and Technology

Additional professional development occurs within two required professional internships in which students can practice the skills and passions developed throughout their individualized plans of study. Preparation for these internships include various impactful experiences in theatre and the performing arts here at Iowa State. This work is vital for students to gain a practical understanding of the rigors of the field.

ISU Theatre and Performing Arts focuses solely on the undergraduate student artist, offering students many opportunities to participate in production experiences throughout the academic year. Students implement the theories and principles explored in the classroom with experiential learning through public performances. These productions vary in scope, taking place in the 435-seat proscenium space at Fisher

Theatre as well as in other intimate and “found” venues both on and off campus. Performing arts majors must maintain a 2.0 GPA to participate in production activities. Scholarships and employment opportunities are available to both incoming and current students on a yearly basis. All areas of ISU Theatre and Performing Arts, including classes and productions, are open to all students regardless of major. Visit here (<https://www.music.iastate.edu/how-get-involved-theatre-and-performing-arts/>) to learn about scholarships and all of the ways to get involved with Theatre and the Performing Arts at ISU.

In addition to building a solid foundation in theatre, Performing Arts graduates enter the world as empathetic members of their community prepared to engage in civic life and meet the challenges of the work force or graduate school with strong skills in leadership, collaboration, and critical thinking.

## Student Learning Outcomes

Upon graduation, students should be able to:

- Recognize the ways in which theatre and performing arts can reflect and change communities and culture.
- Apply collaboration principles to the creation of performing arts.
- Analyze dramatic literature and performances from dramaturgical, performative, sensory, aesthetic, and community perspectives.
- Organize and integrate resources - including human (self and others), technology, and systems - to solve abstract and practical problems.
- Compare and critique performing arts theory, practice, literature, design, performance, and one's own process and work within cultural and historical contexts.

## Bachelor of Arts - Performing Arts Major (Perf)

As majors in the College of Liberal Arts and Sciences, students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated below for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

**All performing arts majors must complete both the performing arts core and at least one of the emphases listed below. A Minimum GPA of 2.00 in both the major core and the chosen emphasis is required to graduate.**

## The Core for the Performing Arts Major (26 credits)

MUSIC 101	Fundamentals of Music	2
THTRE 106	Introduction to the Performing Arts	3
or THTRE 110	Theatre and Society	
or MUSIC 102	Introduction to Music Listening	
THTRE 250	Technical Theatre Practicum	2
THTRE 251	Acting Foundations	3
THTRE 255	Introduction to Theatrical Production	4
THTRE 263	Script Analysis	3
PERF 105	Performing Arts Seminar (Six semesters required at .5 credits per semester)	3
PERF 310	Performing Arts Internship (2 professional internships required)	R
or THTRE 499	Theatre Internship	
PERF 401	Performing Arts Capstone Seminar	2
Choose four credits of DANCE from the following:		4
DANCE 120	Modern Dance I	
DANCE 130	Ballet I	
DANCE 140	Jazz I	
DANCE 150	Tap Dance I	
DANCE 160	Ballroom Dance I	
DANCE 211	Fundamentals and Methods of Social and World Dance	
DANCE 220	Modern Dance Composition	
DANCE 222	Modern Dance II	
DANCE 223	Modern Dance III	
DANCE 232	Ballet II	
DANCE 233	Ballet III	
DANCE 242	Jazz II	
DANCE 250	Yoga Movement	
DANCE 270	Dance Appreciation	
DANCE 320	Sound and Movement	
DANCE 360	History and Philosophy of Dance	
DANCE 370	Advanced Studies in Dance	
DANCE 384	Teaching Children's Dance	
DANCE 385	Methods of Teaching Dance	
DANCE 386	Teaching Dance Technique and Composition	

**Total Credits**

**26**



**Emphasis in Acting/Directing (22 Credits)**

MUSIC 125	Class Voice (1 semester of MUSIC 125 or 118A required) or MUSIC 118A Applied Music: Non-majors: Voice	1
THTRE 151	Actor's Voice and Movement	3
THTRE 393	Studies in Theatre Design and Production Workshop (any THTRE 393)	3
THTRE 455	Directing	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
Choose 6 credits from the following:		6
THTRE 351	Acting: Contemporary Scene Study	
THTRE 352	Puppetry Design and Performance	
THTRE 353	Acting for the Camera	
THTRE 451	Acting: Period Styles	
THTRE 316	Creative Writing: Playwriting	
THTRE 456	Advanced Directing	
THTRE 504	Seminar	
THTRE 504B	Seminar: Acting Techniques	
THTRE 504C	Seminar: Acting Styles	
THTRE 504E	Seminar: Arts Management	
<b>Total Credits</b>		<b>22</b>

**Emphasis in Theatrical Design and Technology (21 credits)**

THTRE 455	Directing	3
THTRE 465	Theatre History: Ancient to 19th Century	3
THTRE 466	Theatre History: 19th Century to Present	3
Choose 12 Credits from the following:		12
THTRE 357	Stage Makeup	
THTRE 393	Studies in Theatre Design and Production Workshop	
THTRE 393A	Studies in Theatre Design and Production Workshop: Costume Design	
THTRE 393B	Studies in Theatre Design and Production Workshop: Scenic Design	
THTRE 393C	Studies in Theatre Design and Production Workshop: Lighting Design	
THTRE 393D	Studies in Theatre Design and Production Workshop: Sound Design	
THTRE 393E	Studies in Theatre Design and Production Workshop: Stagecraft	
THTRE 393F	Studies in Theatre Design and Production Workshop: Costume Draping and Patterning	

THTRE 393G	Studies in Theatre Design and Production Workshop: Advanced Makeup	
THTRE 393I	Studies in Theatre Design and Production Workshop: Stage Management	
THTRE 393J	Studies in Theatre Design and Production Workshop: Technical Direction	
THTRE 393K	Studies in Theatre Design and Production Workshop: Arts Management	
THTRE 393L	Studies in Theatre Design and Production Workshop: Scenic Painting	
THTRE 393M	Studies in Theatre Design and Production Workshop: Costume Construction	
THTRE 504	Seminar	
THTRE 504D	Seminar: Design and Technical Theatre	
THTRE 504E	Seminar: Arts Management	
<b>Total Credits</b>		<b>21</b>

**Emphasis in Musical Theatre (22 credits)**

MUSIC 125	Class Voice (4 semesters of MUSIC 118A and/or 125 required) or MUSIC 118A Applied Music: Non-majors: Voice	4
THTRE 354	Musical Theatre History and Performance	3
THTRE 355	Musical Theatre Auditions and Performance	3
THTRE 465	Theatre History: Ancient to 19th Century or THTRE 466 Theatre History: 19th Century to Present	3
Choose 9 credits from the following:		9
THTRE 151	Actor's Voice and Movement	
THTRE 351	Acting: Contemporary Scene Study	
THTRE 352	Puppetry Design and Performance	
THTRE 353	Acting for the Camera	
THTRE 393	Studies in Theatre Design and Production Workshop (any THTRE 393)	
THTRE 451	Acting: Period Styles	
THTRE 455	Directing	
THTRE 456	Advanced Directing	
THTRE 504	Seminar	
THTRE 504A	Seminar: Musical Theatre	
THTRE 504B	Seminar: Acting Techniques	
THTRE 504C	Seminar: Acting Styles	
THTRE 504E	Seminar: Arts Management	
<b>Total Credits</b>		<b>22</b>

**Emphasis in Dance (21 credits)**

DANCE 360	History and Philosophy of Dance	3
12 Credits of DANCE in addition to DANCE 360 and the six taken in the PERF core. At least 6 credits must be 300+.		12
6 credits of 300+ credits in THEATRE.		6
<b>Total Credits</b>		<b>21</b>

**Suggested Four year plans for Performing Arts majors**

Listed below are example pathways for completing the Performing Arts major. Students will work with their academic adviser to navigate their pathway through the curriculum requirements.

**Performing Arts B.A. - Emphasis in Acting/Directing****Freshman**

Fall	Credits	Spring	Credits
THTRE 251	3	PERF 105	R
THTRE 255	4	THTRE 151	3
PERF 105	R	THTRE 263	3
THTRE 106	3	THTRE 250	1
ENGL 150	3	MUSIC 101	2
LIB 160	1	ENGL 250	3
Dance	1	General	3
Elective		Education Requirement	
		Dance	1
		Elective	
<b>15</b>		<b>16</b>	

**Sophomore**

Fall	Credits	Spring	Credits	Summer	Credits
PERF 105	R	PERF 105	R	PERF 310	R
MUSIC 118A or 125	1	THTRE 351 (or other 300+ Acting class)	3		
THTRE 250	1	Dance Class	1		
Dance Class	1	General Education Requirement	3		
THTRE 393 (any THTRE 393)	3	General Education Requirement	3		

300+	3	300+	3		
Elective	Elective				
General	2	300+	3		
Education	Elective				
Requirement					
General	3				
Education					
Requirement					
LAS 203	1				
15		16		0	
Junior					
Fall	Credits	Spring	Credits	Summer	Credits
PERF 105		R PERF 105		R PERF 310	R
THTRE 455	3	THTRE 466	3		
THTRE 465	3	Dance	1		
		Class			
		Elective			
General	3	General	3		
Education		Education			
Requirement		Requirement			
General	3	General	3		
Education		Education			
Requirement		Requirement			
300+	3	300+	3		
Elective		Elective			
Dance	1	300+	3		
Elective		Elective			
16		16		0	

**Senior**

Fall	Credits	Spring	Credits
PERF 401	2	General Education Requirement	3
THTRE 451 (or other 300+ acting/directing course)	3	300+ Elective	3
General Education Requirement	3	300+ Elective	3
300+ Elective	3	300+ Elective	3

300+	3		
Elective			
	14	12	
Total Credits: 120			

Performing Arts - B.A. - Emphasis in Theatrical Design/Technology

Freshman			
Fall	Credits	Spring	Credits
PERF 105		R PERF 105	R
THTRE 251		3 THTRE 263	3
THTRE 255		4 ENGL 250	3
LIB 160		1 MUSIC 101	2
THTRE 106		3 THTRE 250	1
General Education Requirement		3 General Education Requirement	3
ENGL 150		3 General Education Requirement	3
	17	15	

Sophomore					
Fall	Credits	Spring	Credits	Summer	Credits
PERF 105		R PERF 105		R PERF 310	R
DANCE 270 (Or other Dance course)		3 DANCE 360		3	
THTRE 393 (any 393)		3 THTRE 393A (or other 300+ THTRE Design/ Tech course)		3	
THTRE 250		1 General Education Requirement		3	
General Education Requirement		3 General Education Requirement		3	
General Education Requirement		2 300+ Elective		3	

300+	3		
Elective			
LAS 203	1		
	16	15	0

Junior					
Fall	Credits	Spring	Credits	Summer	Credits
PERF 105		R PERF 105		R PERF 310	R
THTRE 455		3 THTRE 393B (Or other 300+ THTRE Design/ Tech Class)		3	
THTRE 465		3 THTRE 393		3	
General Education Requirement		3 General Education Requirement		3	
General Education Requirement		3 General Education Requirement		3	
300+ Elective		3 300+ Elective		3	
	15	15		0	

Senior			
Fall	Credits	Spring	Credits
PERF 401		2 300+ Elective	3
300+ Elective		3 300+ Elective	3
300+ Elective		3 300+ Elective	3
300+ Elective		3 300+ Elective	3
300+ Elective		3 300+ Elective	3
	14	15	

Total Credits: 122

Performing Arts - B.A. - Emphasis in Musical Theatre

Freshman			
Fall	Credits	Spring	Credits
THTRE 251		3 PERF 105	R
THTRE 255		4 THTRE 263	3
PERF 105		R THTRE 250	1
THTRE 106		3 MUSIC 118A	1

ENGL 150	3 MUSIC 101	2	
LIB 160	1 ENGL 250	3	
MUSIC 118A	1 General Education Requirement	3	
Dance Elective	1 Dance Elective	1	
	THTRE 151 (or other Acting/Directing course)	3	
<b>16</b>		<b>17</b>	

**Sophomore**

Fall	Credits	Spring	Credits	Summer	Credits	
PERF 105		R PERF 105		R PERF 310		R
300+ Elective		3 Dance Class		1		
THTRE 250		1 THTRE 355		3		
Dance Class		1 MUSIC 118A		1		
THTRE 354		3 General Education Requirement		3		
300+ Elective		3 General Education Requirement		3		
General Education Requirement		2 300+ Elective		3		
MUSIC 118A		1				
LAS 203		1				
<b>15</b>		<b>14</b>		<b>0</b>		

**Junior**

Fall	Credits	Spring	Credits	Summer	Credits	
PERF 105		R PERF 105		R PERF 310		R
THTRE 455 (or other 300+ Acting/Directing Course)		3 Dance Class Elective		1		

THTRE 465	3 THTRE 351	3
	(Or other 300+ THTRE Acting/Directing Course)	
General Education Requirement 300+ Elective	3 General Education Requirement	3
	3 General Education Requirement	3
Dance Elective	1 300+ Elective	3
	300+ Elective	3
<b>13</b>		<b>16</b>
<b>0</b>		

**Senior**

Fall	Credits	Spring	Credits	
PERF 401		2 General Education Requirement		3
THTRE 352 (or other 300+ course from degree requirements)		3 300+ Elective		3
THTRE 451 (or other 300+ acting/directing course)		3 300+ Elective		3
General Education Requirement 300+ Elective		3 300+ Elective		3
	3			

300+	3
Elective	
17	12

Total Credits: 120

Please see the Department advisors for more information about suggested Four Year Plans for the Emphases in Dance. Students in all ISU majors must complete a three-credit course in U.S. Diversity and a three-credit course in International Perspectives. Consult the catalogue for a list of approved courses. Discuss with your advisor how these two courses can be applied to your graduation plan.

Performing Arts Minor

To complete the minor in Performing Arts, students must take at least 15 credits of either Theatre or Performing Arts courses. Six credits must be 300 level or higher. *THTRE 224, 250, 290, 301, 469, 490, and 499 do not count toward the Performing Arts minor.* The minor must include at least 9 credits that are not used to meet any other department, college or university requirement. The following classes are required:

PERF 105	Performing Arts Seminar (3 semesters)	0.5
THTRE 255	Introduction to Theatrical Production	4
THTRE 263	Script Analysis	3

U.S. Latino/a Studies Program Overview

Latinos/as/x are the largest and fastest growing culturally diverse population in the United States, representing dynamic and thriving American realities.

U.S. Latino/a Studies at Iowa State University is a cross-disciplinary, coalition-building program that offers well-structured and creative coursework to students interested in the arts, cultures, economies, histories, politics, religions, and literatures of Latino/a/x communities throughout the United States. It facilitates the study of a vast array of communities and individuals with roots in the Caribbean and Latin America, and long-established U.S. citizen communities such as Chicanos/as, Mexican Americans, Tejanos, Californios, Cuban-Americans, Dominican-Americans, and Puerto Ricans on the island and on the mainland.

The program aims to serve as a hub that connects classes, service and outreach opportunities across colleges, schools, and departments. Consequently, students can discover a stimulating field of critical and academic research, engage in an exciting platform on which to link different fields of study, and become part of outreach/community networks in which they will grow to become outstanding, conscientious leaders in their respective careers.

The Program in U.S. Latino/a Studies is well suited to careers in Education, Psychology, History, Sociology, Business, Journalism, Spanish Language and Cultures, Women’s and Gender Studies, and Agriculture. A U.S. Latino/a Studies minor, or a double major with a Latino/a Studies track in Interdisciplinary Studies, strengthens student profiles as they compete for jobs on the global market because they have attained an in-depth experience of local and global experiences of Latin America and the Caribbean, as well as a sophisticated understanding of diversity and inclusion.

The US LS Program offers course work that meets the ISU U.S. Diversity requirement and also offers a 15 credit U.S. Latino/a Studies Minor (<https://usls.las.iastate.edu/minor/>).

U.S. Latina/o/x Studies Program Student Learning Outcomes

Upon the completion of their program of study, students with an interdisciplinary studies major in U.S. Latino/a/x Studies will demonstrate proficiency in four goal areas: Communication, Cross-Cultural Literacy, Critical Thinking, and Lifelong Learning Skills.

- 1. Communication: Key communication skills, including written, oral, and digital. Understanding textual and media sources and ability to apply media literacy to cross-cultural analysis. Working knowledge of social scientific and/or humanistic approaches in the field.
- 2. Cross-Cultural Literacy: Ability to communicate across communities and acknowledge different communicative styles and languages including Spanish, Portuguese, and Indigenous.
- 3. Critical Thinking: Ability to analyze from a transnational/transborder/translocal perspective and to objectively examine the interconnections between Latinx, Caribbean, and Latin American communities. Developing key skills, such as finding and understanding sources, comparing arguments, proposing solutions to discussed problems within an expansive historical perspective that includes class, ethnicity, gender, and race.
- 4. Lifelong Learning Skills: Acquisition of practical hands-on skills in community engagement, extension and outreach service, in different settings such as urban, rural, and international.

Interdisciplinary Studies Major, Track in U.S. Latino/a Studies

In addition to meeting the general requirements for the Interdisciplinary Studies major, students wishing to complete a track in U.S. Latino/a Studies must complete a minimum of 36 credits in the area of U.S. Latino/a Studies including US LS 211 (Introduction to U.S. Latino/a Studies) and an experiential learning course (US LS 325 or US LS 499). At least 15 of the 36 credits must be in courses numbered 300 and above and 6 credit hours must be earned at the 400-level. Students must also meet the upper-level communication proficiency requirement by taking

English 302 or 314. Students can work with the US LS program director and an Interdisciplinary Studies advisor to explore options within this individualized major program.

### Required Courses (36 credits)

US LS 211	Introduction to U.S. Latino/a Studies	3
One Experiential Learning course in US LS		3
US LS 325	Culture and Community: Iowa and Midwest Latino/as	
US LS 377X	Latina/o/x Life Stories: Memoirs and Oral History	
US LS 499	Internship in US Latino/a Studies	
Two of the following Historical Foundations of US LS		6
US LS 372	Latina/o History	
HIST 340	History of Latin America I	
HIST 341	History of Latin America II	
Two of the following Social Science Foundations of US LS		6
US LS 343	Latin American Government and Politics	
US LS 347	U.S. Latino/a Psychology	
US LS 360	Latinas and Victimization	
US LS 473	Civil Rights and Ethnic Power	
ANTHR 323	Topics in Latin American Anthropology	
SOC 332	The Latino/Latina Experience in U.S. Society	
SPAN 322	Latin American Civilization	
SPAN 324	Latin America Today	
Two of the following Literature and Language in US LS		6
SPAN 304	Spanish for Global Professionals	
SPAN 305	Spanish for Heritage Speakers	
SPAN 445	Seminar on the Literatures and Cultures of Latin America	
And twelve additional credits from any US LS, US LS cross-listed, or other course listed above		12
<b>Total Credits</b>		<b>36</b>

#### Notes

1. The list of acceptable courses may include courses not currently listed. Contact the Director of US Latino/a Studies for information on eligible courses.
2. The student must have an average grade of C in courses applied to the major.
3. Fulfillment of the world language requirement with Spanish is strongly recommended, but not required. Students pursuing multiple majors can apply up to nine (9) credits of approved Spanish courses (304, 322, 324, 445) to both the US LS and their other major.

As majors in the College of Liberal Arts and Sciences, Interdisciplinary Studies students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

### U.S. Latino/a Studies Minor

The minor in US Latino/a Studies requires a minimum of 15 credit hours including US LS 211 (Introduction to U.S. Latino/a Studies) and an experiential learning course (US LS 325 or US LS 499). University policy indicates that minors must include at least 9 credits that are not applied to any other degree requirement.

#### Required course work

US LS 211	Introduction to U.S. Latino/a Studies	3
One of the following:		3
US LS 325	Culture and Community: Iowa and Midwest Latino/as	
US LS 377X	Latina/o/x Life Stories: Memoirs and Oral History	
US LS 499	Internship in US Latino/a Studies	
And nine credits from any US LS or US LS cross-listed course		9
<b>Total Credits</b>		<b>15</b>

#### Notes:

1. A limit of six (6) credits of approved Spanish courses (SPAN 304, SPAN 322, SPAN 324, SPAN 445) may be substituted for US LS courses.
2. A maximum of 3 credit hours of US LS 490 (Independent Study) may be applied toward the minor.

## Women's and Gender Studies Overview

The Women's and Gender Studies Program is a cross-disciplinary program in the College of Liberal Arts and Sciences. The program offers students opportunities to analyze issues concerning women, gender, and sexuality in diverse cultural contexts and to investigate a variety of disciplines from feminist perspectives. The field of women's and gender studies creates an understanding that interrelated factors—e.g., race, ethnicity, class, age, disability, gender identity, religion, national origin,



and sexual orientation—inform knowledge of women's history, culture, and social roles.

Women's and Gender Studies seeks to improve critical thinking and to provide students with the intellectual means to question prevailing assumptions. It encourages students to explore the contexts and ideological origins of knowledge and to examine the relationship between knowledge and power in society. By promoting social justice and inclusion, this area of study focuses on the connections between personal experience and political activity, and validates student contributions and voices.

Graduates from this program are skilled in critical thinking, research methods, and effective communication. Because they have developed a thorough understanding of gender, race, and class, graduates work effectively with employers, colleagues, and clients to analyze and solve complex social problems. Women's and Gender Studies students also acquire strong backgrounds for careers in areas such as counseling, education, human resources, international development, public policy, politics, business, and law. The program includes core and cross-listed courses in anthropology, history, economics, English, history, health and human performance, political science, psychology, religion, sociology, speech communication, and world languages and cultures.

## Student Learning Outcomes

Through student-driven discussions, based on engagement with critical and cultural texts by feminist scholars and activists, the Women's and Gender Studies Program curriculum will help students develop the necessary skills to:

- Increase awareness of women's history and experiences that affect representations of gender in contemporary society
- Explore forms of social inequality through feminist theories and concepts
- Understand how intersecting identities shape individuals and their life experiences
- Analyze gender dynamics in different types of relationships

## Degree Requirements

### Women's and Gender Studies (B.A., B.S.)

An undergraduate major requires a minimum 2.00 GPA in the 34 credits of core and cross-listed courses. Women's and Gender Studies' majors must satisfy the following requirements:

1. 16 credits selected from Women's and Gender Studies core courses (WGS).

#### A. Required core courses:

WGS 160	Gender Justice	1
WGS 201	Introduction to Women's and Gender Studies	3

WGS 301	International Perspectives on Women and Gender	3
WGS 401	Feminist Theories	3
WGS 402	Feminist Research in Action	3
WGS 491	Internship	3
or WGS 499	Senior Thesis	

**Total Credits** **16**

B. The remaining 18 credits of required coursework can be chosen from one of the following Areas of Emphasis: 1) Communication and Cultural Representation; 2) Identities and Sexualities; 3) Leadership and Social Justice; or students can work with their advisor to identify the set of courses that support their personal and professional goals.

#### 1) Communication and Cultural Representation

Courses in this field offer diverse perspectives on how media and communication represent and shape culture in the US and around the world. Students engage with feminist literature, philosophy, art, and other expressions of culture in society. These themes are used to examine how the lives and roles of women have changed throughout history.

WGS 210	Gender and Sexuality in American Pop Culture	3
WGS 308	Write Like a Woman	3
WGS 323	Gender and Communication	3
WGS 325	Portrayals of Gender and Sexualities in the Media	3
WGS 327	Gender and Sexualities in Society	3
WGS 338	Feminist Philosophy	3
WGS 345	Women and Literature: Selected Topics	3
ENGL 349	Topics in Multicultural Literatures of the United States	3
WGS 352	Queer Literature	3
WGS 370	Studies in English Translation	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3
WGS 422	Women, Men, and the English Language	3
WGS 430	Gender and Consumer Culture	3
WGS 450	Topics in Women's and Gender Studies	3
WGS 460	Seminar in Gender and Ethnicity	3
WGS 490	Independent Study	1-3
WGS 494	Women/Gender in Art	3
WGS 545	Women's Literature	3
WGS 594	Women/Gender in Art	3

#### 2) Identities and Sexualities

This area highlights the growing emphasis in Women's and Gender Studies on how experiences and societal narratives shape and are impacted by gender identities and sexualities. Courses explore power relations, oppression, privilege, and resistance as ways of understanding

these social identities. Students will learn about how issues of race, class, gender, sexuality, and other axes of difference intersect and enable political resistance.

WGS 203	Introduction to Lesbian Communities	3
WGS 205	Introduction to Queer Studies	3
WGS 210	Gender and Sexuality in American Pop Culture	3
WGS 308	Write Like a Woman	3
WGS 325	Portrayals of Gender and Sexualities in the Media	3
WGS 327	Gender and Sexualities in Society	3
WGS 328	Sociology of Masculinities and Manhood	3
WGS 336	Religion, Sex and Gender	3
WGS 339	Goddess Religions	3
WGS 344	Human Reproduction	3
WGS 346	Psychology of Women	3
ENGL 349	Topics in Multicultural Literatures of the United States	3
WGS 350	Women of Color in the U.S	3
WGS 352	Queer Literature	3
WGS 374	Sex, Gender, and Culture in the Ancient Mediterranean World	3
WGS 380	History of Women in Science, Technology, and Medicine	3
WGS 386	History of Women in America	3
WGS 410	Human Trafficking	3
WGS 425	Intersections of Race, Class and Gender	3
WGS 430	Gender and Consumer Culture	3
WGS 440	Gender Issues in Sports	3
WGS 450	Topics in Women's and Gender Studies	3
WGS 457	History of American Sexualities	3
WGS 490	Independent Study	1-3
WGS 494	Women/Gender in Art	3
WGS 525	Intersections of Race, Class and Gender	3
WGS 586	Readings Seminar in Women's and Gender History	3

### 3) Leadership and Social Justice

Courses in this area of specialization provide students with the tools and theories needed to become successful change agents, activists, and community organizers. These courses explore how social movements can transform communities, cultural norms, and global systems. Students will engage with critiques and the context of movements such as transnational feminism, Black Lives Matter, LGBTQIA+ Pride, and #MeToo.

WGS 210	Gender and Sexuality in American Pop Culture	3
WGS 307	Women in Science and Engineering	3

WGS 320	Ecofeminism	3
WGS 321	Economics of Discrimination	3
WGS 333	Women, Gender, and Leadership	3
WGS 344	Human Reproduction	3
WGS 350	Women of Color in the U.S	3
WGS 380	History of Women in Science, Technology, and Medicine	3
WGS 385	Women in Politics	3
WGS 386	History of Women in America	3
WGS 387	First Ladies in U.S. History	3
WGS 410	Human Trafficking	3
WGS 425	Intersections of Race, Class and Gender	3
WGS 435	Gender, Globalization and Development	3
WGS 440	Gender Issues in Sports	3
WGS 450	Topics in Women's and Gender Studies	3
WGS 488	Research on Gender and Leadership	3
WGS 490	Independent Study	1-3
WGS 586	Readings Seminar in Women's and Gender History	3

A minor or additional major is recommended. The typical degree awarded is a Bachelor of Arts; students interested in a Bachelor of Science degree in Women's and Gender Studies need to complete 12 credits in addition to the general education requirements across the areas of natural science, mathematics, and social science.

### Communication Proficiency requirement:

The Women's and Gender Studies major requires credit for ENGL 150; ENGL 250 (or ENGL 250H) (with a grade of C or better, per the university-wide Communication Proficiency Grade Requirement); and WGS 301 or WGS 401 or WGS 402 (with a grade of C or better).

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

LAS majors require a minimum of 120 credits, **including a minimum of 45 credits at the 300/400 level**. You must also complete the LAS General Education requirements as well as the world language and career proficiency requirements.

As majors in the College of Liberal Arts and Sciences, Women's and Gender Studies students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated above for the major.

## Four Year Plan

### Women's and Gender Studies, B.A., B.S. (1)

#### Freshman

Fall	Credits Spring	Credits
ENGL 150	3 WGS 201	3
LIB 160	1 Math Choice	3
World Language/Elective <sup>1</sup>	3-4 World Language/Elective	3-4
Humanities Choice	3 Humanities Choice	3
Natural Science Choice	3 Social Science Choice	3
Social Science Choice	3	

**16-17 15-16**

#### Sophomore

Fall	Credits Spring	Credits
U.S. Diversity Choice	3 Women's and Gender Studies Choices - 200/300 Level	6
WGS 301	3 Int'l Perspectives Choice	3
WGS 160	1 Humanities Choice	3
Humanities Choice	3 Social Science Choice	3
ENGL 250	3 LAS 203	1
Natural Science Choice	3	

**16 16**

#### Junior

Fall	Credits Spring	Credits
Women's and Gender Studies Choice - 300/400 Level	3 Electives - 300/400 Level	9
Electives	7 WGS 402	3
Natural Science Choice	2 Women's and Gender Studies Choice - 300/400 Level	3
WGS 401	3	

**15 15**

#### Senior

Fall	Credits Spring	Credits
Women's and Gender Studies Choice - 300/400 Level	6 Electives	5
Elective - 300/400 Level	6 Electives - 300/400 Level	6

WGS 491 or 499	1-3 Women's and Gender Studies Choice - 300/400 Level	3
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**13-15 14**

**Total Credits: 120-124**

## Minor

Undergraduate students may minor in Women's and Gender Studies by taking 15 semester hours of Women's and Gender Studies classes, including the following:

WGS 201	Introduction to Women's and Gender Studies	3
WGS 301	International Perspectives on Women and Gender	3

One 400-level WGS course and 6 additional credits in WGS; at least 3 of the additional credits must be at the 300-400 level.

University policy requires that at least 9 credits used for the minor stand alone and are not used to meet any other requirement. All WGS courses for the minor require a grade of C (not C-) or higher.

Any student can declare a major or minor in Women's and Gender Studies or choose to co-major in another program. Students interested in a minor or major in Women's and Gender Studies should contact the director or the undergraduate advisor in the program.

## Graduate Study

The graduate minor in Women's and Gender Studies is designed to provide students with knowledge of theories and methods within a variety of approaches in feminist scholarship. The program seeks to integrate and synthesize knowledge from many disciplines and to offer students opportunities for systematic study of gender and women's experiences and perspectives in all knowledge fields. Students will be prepared to take a leadership role in supporting gender equity and diversity in their careers in education, social service work, business, law, public policy, governmental and non-governmental organizations, and research.

The graduate minor requires 12 credits for students enrolled in a master's or a doctoral degree program. Students are required to take either WGS 501 Contemporary Feminist Theories or WGS 502 Advanced Seminar in Feminist Research Methods; taking both is strongly recommended. Students will also take two or three electives selected from the list of core and cross-listed Women's and Gender Studies courses approved for graduate study. At least one member of the Women's and Gender Studies faculty will serve on the program of study for doctoral students. A list of eligible faculty members may be obtained from the Director of the Women's and Gender Studies Program.

## World Film Studies Minor

### World Film Studies

The World Film Studies undergraduate minor is an interdisciplinary, cross-cultural program in the department of World Languages and Cultures that provides coursework in the history, theory, and aesthetics of world cinemas. Upon completion of the World Film Studies minor students will

- 1) demonstrate solid skills of formal film analysis and knowledge of the essential theoretical concepts of cinema studies;
- 2) become familiar with prominent film directors, influential cinematic works, and cinematic traditions across the world;
- 3) gain an understanding of the evolution of cinema as an art form; understand the relations between cinema and other arts;
- 4) acquire knowledge and understanding of cinema as a mode of cultural expression and communication; develop new perspectives on U.S. culture and cinema through comparison with other world cultures and cinemas.

A student seeking an undergraduate minor in World Film Studies must successfully complete a minimum of 15 credits, which must include W F S 278 Introduction to Global Film or ENGL 237 Survey of Film History and 12 credits selected from the following list of electives. Of these, at least 6 credits must be from courses taught in the department of World Languages and Cultures. The minor must include at least 9 credits that are not used to meet any other department, college or university requirement.

Courses taught in WLC (at least 6 credits)

CHIN 378	Chinese Film and Society	3
FRNCH 326	French and Francophone Film	3
FRNCH 378	French Cinema	3
GER 378	German Film and Media Studies	3-4
RUS 378	Russian Film Studies in English	3
SPAN 326	Studies in Hispanic Art or Film	3
SPAN 378	Hispanic Film Studies in English	3

Courses outside of WLC (up to 6 credits)

ENGL 315	Creative Writing: Screenplays	3
ENGL 335	Studies in Film	3
ENGL 450	Seminar in Literary Genres	3
JL MC 307	Digital Video Production	3
AM IN 205	American Indians in the Movies	3

Curricular note: no more than 6 credits of each repeatable course (FRNCH 326 and FRNCH 378) may be applied to the minor. Both WLC 278 and ENG 237 (6 credits max) may count toward the minor.

## World Languages and Cultures

### OVERVIEW OF DEPARTMENT OFFERINGS

World language study should be an integral part of an academic program for most students. The theoretical understanding of and practical experience in language underlie many intellectual disciplines that try to meet the complex problems of contemporary society. Courses offered by the Department of World Languages and Cultures are designed to develop students' understanding of a second culture through the language spoken by that culture.

### The Department of World Languages and Cultures offers the following majors:

- Anthropology (B.A. or B.S.)
- World Languages and Cultures (B.A.) with the following options:
  - French
  - German
  - Spanish
- World Languages and Cultures Additional Major with the following options for students with a primary major in another field:
  - French - OR - French (Languages and Cultures for Professions)
  - German - OR - German (Languages and Cultures for Professions)
  - Spanish - OR - Spanish (Languages and Cultures for Professions)

### The Department of World Languages and Cultures offers the following minors:

- Anthropology
- Chinese Studies
- Chinese Studies (Languages and Cultures for Professions)
- French
- German
- German (Languages and Cultures for Professions)
- Middle Eastern Studies
- Russian Studies
- Russian Studies (Languages and Cultures for Professions)
- Spanish (Hispanic Studies)
- Spanish (Languages and Cultures for Professions)
- Spanish Translation and Interpretation Studies
- World Film Studies

### Additional Language Instruction

- American Sign Language
- Arabic
- Classical Latin
- Italian
- Portuguese

## The Department houses several College of Liberal Arts and Sciences Cross Disciplinary Studies Programs:

- American Indian Studies
- Classical Studies
- International Studies
- U.S. Latino/a Studies

Students at all levels of world language study will have access to the Language Studies Resource Center, located in 3142 Pearson. The Resource Center contains an extensive collection of world language materials, including audio-visual materials, electronic resources, music, books, language specific software and hardware, and other course-related materials.

## WORLD LANGUAGES AND CULTURES, B.A.

World Languages and Cultures (B.A.) with the following options:

- French
- German
- Spanish
- Language Teacher Preparation (added to the primary language option)

As majors in the College of Liberal Arts and Sciences, World Languages and Cultures students must meet College of Liberal Arts and Sciences and University-wide requirements for graduation in addition to those stated for the major and option.

## WORLD LANGUAGES AND CULTURES ADDITIONAL MAJOR

The World Languages and Cultures Additional Major has six options, plus teacher preparation.

- French
- French (Languages and Cultures for Professions)
- German
- German (Languages and Cultures for Professions)
- Spanish
- Spanish (Languages and Cultures for Professions)
- Language Teacher Preparation (added to primary language option)

## Student Learning Outcomes for the World Languages and Cultures Major

Upon the completion of their program of studies in the Department of World Languages and Cultures, majors with a concentration in French, German, or Spanish will demonstrate proficiency in five goal areas: Communication, Cultures, Connections, Comparisons, and Communities. Using their concentration language, students will be able to:

1. **COMMUNICATION:** understand, interpret, and present information, to negotiate meaning, and to communicate in spoken or written conversations to share information, reactions, feeling, and opinions to various audiences of listeners, readers, or viewers.
2. **CULTURES:** investigate, explain, and reflect on the relationship between the practices and the perspectives of the cultures studied.
3. **CONNECTIONS:** demonstrate their ability to build, reinforce, and expand their knowledge of other disciplines and to access and evaluate information from diverse perspectives, while also developing critical thinking to solve problems creatively.
4. **COMPARISONS:** investigate, explain, and reflect on the nature of language as well as the concept of culture through comparisons of their own culture with other cultures and the language studied.
5. **COMMUNITIES:** demonstrate an ability to use the language both within and beyond the classroom and to interact and collaborate in their community and the globalized world while also setting goals and reflecting on their progress in using languages for enjoyment, enrichment, and advancement.

Graduates will achieve both linguistic proficiency and cultural literacy through the study of the language and culture of their program. Linguistic proficiency entails the ability to function effectively in the target language and the ability to communicate competently with native speakers of the target language. Students of Latin and Ancient Greek demonstrate proficiency by becoming able to read the languages and to translate from these languages into clear and idiomatic English. Cultural literacy includes a general knowledge of the culture's history, familiarity with its literature, and basic knowledge of its social and political institutions.

## GENERAL B.A. REQUIREMENTS

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

**Communication Proficiency Requirements:** According to the university-wide Communication Proficiency Grade Requirement, students must demonstrate their communication proficiency by earning a grade of C or better in ENGL 250 Written, Oral, Visual, and Electronic Composition (or ENGL 250H Written, Oral, Visual, and Electronic Composition: Honors). As the upper-level communication requirement, the Department requires a grade of C or better in any course numbered

between 370 and 379 taught by the Department of World Languages and Cultures (with the exception of Anthropology courses) or the interdepartmental program in Classical Studies. Such a course will also fill an LAS Area I (Arts and Humanities) requirement.

## LANGUAGES AND CULTURES FOR PROFESSIONS (LCP)

What is Languages and Cultures for Professions? The primary objective of the LCP options is to provide learning environments within which students can achieve global literacy, linguistic proficiency, and intercultural competence. In the LCP curriculum, students will learn how professions are shaped by social and cultural forces and, alternatively, how professions shape society. In courses on contemporary culture and society, students will identify and analyze issues dealing with the complex interrelationships of languages and cultures and consider how they may affect their chosen profession. Students will experience living and working in diverse cultural settings through study abroad and internship opportunities offered through the LCP program and/or in collaboration with their respective primary-major colleges or the ISU Study Abroad Center.

Students can complete a World Languages and Cultures Additional Major with an option in French LCP, German LCP, or Spanish LCP. The following LCP minors are available: Chinese Studies (LCP), German (LCP), Russian Studies (LCP), Spanish (LCP). Students enrolled in an LCP option of the World Languages and Cultures Additional Major may receive non-graded academic credit for the successful completion of internships (WLC courses numbered 499 in each language area).

For the LCP options of the World Languages and Cultures Additional Major, students will complete 30 credits within their language concentration (see specific language requirements to the right) beyond the fourth-semester level, selected from the list of approved LCP core courses and electives designated for their respective college curricula. Students may only enroll in the LCP options as an WLC Additional Major and may not graduate with the LCP option in the WLC primary major.

Students in the College of Business may combine course work in the International Business (IB) Secondary Major with course work in LCP by selecting from a list of approved options. Students should consult their academic advisor in the College of Business and the WLC advisor for coursework and international experience that fulfill requirements in both the IB and LCP options.

## American Sign Language (ASL)

The Department of World Languages and Cultures offers coursework in American Sign Language. There are no minors or major options.

A listing of American Sign Language Coursework is available in the A-Z course list and below.

### Courses primarily for undergraduate students

#### ASL 101: American Sign Language I

(4-0) Cr. 4. F.S.

Introduction to American Sign Language (ASL). Development of expressive and receptive skills including vocabulary, grammar, usage, and cultural information. Note: Distinct from "Signed English". ASL is a natural language with its own rules of grammar and usage.

#### ASL 102: American Sign Language II

(4-0) Cr. 4. S.

*Prereq: ASL 101*

Introduction to American Sign Language (ASL) II continues development of expressive and receptive skills introduced in American Sign Language I, including vocabulary, grammar, usage, and cultural information. Distinct from "Signed English". ASL is a natural language with its own rules of grammar and usage.

#### ASL 107: Introduction to the Deaf-World

(1-0) Cr. 1.

Nature and significance of the Deaf-World as a cultural and linguistic minority.

#### ASL 201: Intermediate American Sign Language I

(4-0) Cr. 4. F.

*Prereq: ASL 102*

Development of fluency for intermediate conversational skills. Review of grammar and varying grammatical forms for both structured and unstructured social situations such as sharing opinions, discussing weekend activities, and exchanging views on current topics.

#### ASL 202: Intermediate American Sign Language II

(4-0) Cr. 4. S.

*Prereq: ASL 201*

A continuation and further application of language principles learned in ASL 201, to deepen ability to actively engage in dialogue both in structured and unstructured social situations. Further fluency in intermediate conversational skills will be developed, particularly in the areas of semantic equivalence and dialogic/monologic register.

#### ASL 275: Topics in Deaf Culture

(3-0) Cr. 3.

Focus on contemporary topics in Deaf Culture, Communities, and History. Readings and discussion from a wide range of sources. Topics vary according to faculty interest.



**ASL 305: ASL Classifiers and Depiction**

(3-0) Cr. 3.

*Prereq: ASL 201*

Focused analysis, documentation, discussion, and increased development of classifiers and depiction in ASL. Investigation in how these grammatical features are deliberately incorporated into conversational, presentational, scientific, and artistic language production.

**ASL 325: Deaf Peoples: Pre-World War II**

(3-0) Cr. 3. F.

*Prereq: ASL 202 or Permission of Instructor*

Perspectives on and treatment of deaf people as individuals and groups prior to World War II. Taught in American Sign Language.

**ASL 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits in ASL; Permission of Instructor*

Designed to meet the needs of students in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 6 credits of ASL 490 may be counted towards graduation.

Arabic (Arabc)

The Department of World Languages and Cultures offers coursework in Arabic. There are no minors or major options.

A listing of Arabic Coursework is available in the A-Z course list and below.

**ARABC 101: Elementary Arabic I**

(4-0) Cr. 4. F.

Beginning level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture. Attention to the use of the Arabic alphabet.

**ARABC 102: Elementary Arabic II**

(4-0) Cr. 4. S.

*Prereq: ARABC 101 or placement by department exam*

Continuation of ARABC 101. Beginning level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 195: Study Abroad**

Cr. arr. Alt. SS., offered irregularly.

Supervised instruction in Arabic language and culture, formal class instruction at level appropriate to student’s training, augmented by practical living experience. Taught in Arabic.

**ARABC 201: Intermediate Arabic I**

(4-0) Cr. 4. F.

*Prereq: ARABC 102 or placement by department exam*

Intermediate level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 202: Intermediate Arabic II**

(4-0) Cr. 4.

*Prereq: ARABC 201 or placement by department exam*

Continuation of Arabic 201. Intermediate level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 295: Study Abroad**

Cr. arr. Alt. SS., offered irregularly.

*Prereq: ARABC 102*

Supervised instruction in Arabic language and culture, formal class instruction at level appropriate to student’s training, augmented by practical living experience. Taught in Arabic.

**ARABC 375: Arab Culture**

Cr. 3. S.

Survey of contemporary Arab culture in the Middle East and North Africa as reflected in history, language, the arts, and social institutions with attention to the Arab Diaspora. Taught in English.

Meets International Perspectives Requirement.

**ARABC 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Independent study with focus on areas other than those in which courses are offered. No more than 6 credits in ARABC 490 may be counted toward graduation.

Chinese  
 Minor in Chinese Studies

The Minor in Chinese Studies requires the following 17 credits:

CHIN 201	Intermediate Mandarin Chinese I	4
CHIN 202	Intermediate Mandarin Chinese II	4
Electives at the 300 level and above		
6-9 credits from the following		6-9
CHIN 301	Advanced Mandarin Chinese I	
CHIN 302	Advanced Mandarin Chinese II	
CHIN 304	Chinese for Global Professionals	
CHIN 370	Chinese Literature in English Translation	

CHIN 372	Introduction to Chinese Culture
CHIN 375	China Today
CHIN 378	Chinese Film and Society
CHIN 403A	Seminar in Chinese Language and Culture: Translating Contemporary Chinese Texts
or CHIN 403I	Seminar in Chinese Language and Culture: Topics on Business and Professions
or CHIN 403J	Seminar in Chinese Language and Culture: Reading Chinese Texts

0-3 credits from the following:

ARCH 427	History, Theory, and Criticism of Chinese Architecture
HIST 336	History of Modern China I
HIST 337	History of Modern China II
POL S 342	Chinese Politics

### Minor in Chinese Studies LCP (Languages and Cultures for Professions)

Students who complete a Minor in Chinese Studies (Languages and Cultures for Professions) seek to become culturally-competent global professionals and engage in language and cultural training. The minor requires the following 17 credits:

CHIN 201	Intermediate Mandarin Chinese I	4
CHIN 202	Intermediate Mandarin Chinese II	4

Electives at the 300 level and above

6-9 credits from the following: 6-9

CHIN 301	Advanced Mandarin Chinese I
CHIN 302	Advanced Mandarin Chinese II
CHIN 304	Chinese for Global Professionals
CHIN 370	Chinese Literature in English Translation
CHIN 372	Introduction to Chinese Culture
CHIN 375	China Today
CHIN 378	Chinese Film and Society
CHIN 403A	Seminar in Chinese Language and Culture: Translating Contemporary Chinese Texts
or CHIN 403I	Seminar in Chinese Language and Culture: Topics on Business and Professions
or CHIN 403J	Seminar in Chinese Language and Culture: Reading Chinese Texts
CHIN 499	Internship in Chinese

0-3 credits from the following:

ARCH 427	History, Theory, and Criticism of Chinese Architecture
HIST 336	History of Modern China I

HIST 337	History of Modern China II
POL S 342	Chinese Politics

Students in the Chinese LCP Minor are encouraged to study abroad in a Chinese-speaking country or complete a relevant internship.

A listing of all Chinese Coursework is available in the A-Z course list.

## FRENCH

### World Languages and Cultures, B.A., French Option

See World Languages and Cultures, B.A. for general requirements.

W.L.C. (World Languages and Cultures) Students with a concentration in French must complete at least 30 credits beyond the intermediate level (FRNCH 201 & FRNCH 202).

Required Courses for the French Studies Option (12 credits)

FRNCH 301	Language, Culture, Contexts	3
FRNCH 302	Text and Media Analysis	3
FRNCH 340	Cultural Expressions in the French-Speaking World	3
FRNCH 440	Seminar in French and/or Francophone Studies	3

Additional Courses (at least 18 credits)

FRNCH 304	French for Global Professionals	3
FRNCH 305	French Conversation	3
FRNCH 310	French Pronunciation	1
FRNCH 320	France Today	3
FRNCH 326	French and Francophone Film	3
FRNCH 340	Cultural Expressions in the French-Speaking World	3
FRNCH 370	French Studies in English	4
FRNCH 375	Francophone Studies in English	4
FRNCH 378	French Cinema	4
FRNCH 395	Study Abroad	1-10

French Option WLC Majors must enroll in FRNCH 370, FRNCH 375, and/or FRNCH 378 for 4 credits in French. No more than 12 credits from FRNCH 370, FRNCH 375, and/or FRNCH 378 may be counted for the major. Credit from French 395 "En France" or an approved study abroad program may be applied to the major.

Study Abroad: The department strongly recommends that all students of French participate in an approved study abroad program based in a French-speaking country. Credit from an approved study abroad program may be applied to the major or minor.

### Language Teacher Preparation Option

EDUC 487	Methods in Secondary School World Language Instruction (same as WLC 487 & LING 487)	3
or ENGL 318	Introduction to ESL methods and materials	
PSYCH 230	Developmental Psychology	3

POL S 111	Introduction to American Government (or a course in U.S. History )	3
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Additional requirements of the Secondary Major in Education. See footnote for catalog link to requirements. <sup>TP</sup>

TP Students preparing to teach a language declare the Secondary Major in Education and complete the additional course requirements.

### World Languages and Cultures Additional Major, French Option

The requirements for the World Languages and Cultures Additional Major with the French Option are the same as the major requirements for the primary major listed above.

### World Languages and Cultures Additional Major, French Language and Cultures for Professions (LCP) Option

Students who complete an additional major in World Languages and Cultures with LCP Option seek to become culturally-competent global professionals and engage in language and cultural training. Note: Students may only enroll in the French Languages and Cultures for Professions (LCP) Option as an additional major; they may not graduate with this as a primary major.

Students are required to take at least 30 credits beyond the intermediate level (FRNCH 201 & FRNCH 202).

Required LCP Core Courses (16 credits)		
FRNCH 301	Language, Culture, Contexts	3
FRNCH 302	Text and Media Analysis	3
FRNCH 304	French for Global Professionals	3
FRNCH 320	France Today	3
FRNCH 340	Cultural Expressions in the French-Speaking World	3
FRNCH 499	Internship in French	1-3
Additional Courses (at least 14 credits)		
FRNCH 305	French Conversation	3
FRNCH 310	French Pronunciation	1
FRNCH 326	French and Francophone Film	3
FRNCH 340	Cultural Expressions in the French-Speaking World	3
FRNCH 370	French Studies in English	4
FRNCH 375	Francophone Studies in English	4
FRNCH 378	French Cinema	4
FRNCH 395	Study Abroad	1-10
FRNCH 440	Seminar in French and/or Francophone Studies	3

French LCP Option WLC Majors must enroll in FRNCH 370, FRNCH 375 and/or FRNCH 378 for 4 credits in French. No more than 12 credits from FRNCH 370, FRNCH 375 and/or FRNCH 378 may be counted for the major. Credit from French 395 "En France" or an approved study abroad program may be applied to the major.

## MINOR IN FRENCH

The French Minor requires at least 17 credits of courses taught in French beyond the elementary level (FRNCH 101 Elementary French I & FRNCH 102 Elementary French II).

Required Core Courses (11 credits)		
FRNCH 201	Intermediate French I	4
FRNCH 202	Intermediate French II	4
FRNCH 301	Language, Culture, Contexts	3
Additional Courses (at least 6 credits)		
FRNCH 302	Text and Media Analysis	3
FRNCH 304	French for Global Professionals	3
FRNCH 305	French Conversation	3
FRNCH 320	France Today	3
FRNCH 326	French and Francophone Film	3
FRNCH 340	Cultural Expressions in the French-Speaking World	3
FRNCH 395	Study Abroad	1-10
FRNCH 440	Seminar in French and/or Francophone Studies	3

Credit from French 395 "En France" or an approved study abroad program may be applied to the minor. French 370, 375, 378, and 476 cannot count toward the minor. Students who place into and earn credit in the 300-level sequence may replace FRNCH 201 & 202 with test-out credit.

Study Abroad: The department strongly recommends that all students of French participate in an approved study abroad program based in a French-speaking country. Credit from an approved study abroad program may be applied to the major or minor.

A listing of all French Coursework is available in the A-Z course list.

## GERMAN

### World Languages and Cultures, B.A., German Studies Option

See World Languages and Cultures, B.A. for general requirements.

Students with a concentration in German must complete at least 30 credits beyond the intermediate level (GER 201 (<https://currentcatalog.registrar.iastate.edu/collegeofliberalartsandsciences/worldlanguagesandcultures/>) & GER 202 (<https://>

currentcatalog.registrar.iastate.edu/collegeofliberalartsandsciences/worldlanguagesandcultures/)).

#### German Studies Option Required Core Courses (22 credits)

GER 301	Reading	3
GER 302	Composition	3
GER 304	German for Global Professionals	3
GER 305	Conversation	3
GER 320	Germany Today	3
GER 330	German Literature and Culture	3
GER 476	Topics in German Cultural Studies	4

#### Additional Courses (8 credits)

GER 330	German Literature and Culture (Repeatable once when offered with a different topic.)	
GER 499	Internship in German (Study Abroad and Internship Option)	

Courses taught in English (maximum of eight credits applicable towards the major; must enroll for 4 credits)

GER 370	German Studies in English	
GER 371	The Holocaust in Text, Image, and Memory	
GER 375	Grimms' Tales	
GER 378	German Film and Media Studies	

Study Abroad: The department strongly recommends that all students of German participate in an approved study abroad program based in a German-speaking country. Credit from an approved study abroad program may be applied to the major.

### Language Teacher Preparation Option

EDUC 487	Methods in Secondary School World Language Instruction (same as WLC 487 & LING 487)	3
or ENGL 318	Introduction to ESL methods and materials	
PSYCH 230	Developmental Psychology	3
POL S 111	Introduction to American Government (or a course in U.S. History)	3

Additional requirements of the Secondary Major in Education. See footnote for catalog link to requirements. <sup>TP</sup>

TP Students preparing to teach a language declare the Secondary Major in Education and complete the additional course requirements.

### World Languages and Cultures Additional Major, German Option

The requirements for the World Languages and Cultures Additional Major with the German Option are the same as the major requirements for the primary major listed above.

### World Languages and Cultures Additional Major, German Studies Language and Cultures for Professions (LCP) Option

Students who complete an additional major in World Languages and Cultures with LCP Option seek to become culturally-competent global professionals and engage in language and cultural training. Note: Students may only enroll in the German Studies Languages and Cultures for Professions (LCP) Option as an additional major; they may not graduate with this as a primary major.

Students must complete a minimum of 30 credits beyond the intermediate level (GER 201 Intermediate German I & GER 202 Intermediate German II).

#### Required German LCP Core Courses (19 credits)

GER 301	Reading	3
GER 304	German for Global Professionals	3
GER 305	Conversation	3
GER 320	Germany Today	3
GER 476	Topics in German Cultural Studies	4
GER 499	Internship in German (or approved credit-bearing study abroad experience)	3

#### Additional Courses (11 credits)

GER 302	Composition	3
GER 330	German Literature and Culture	3

Courses taught in English (maximum of eight credits applicable towards the major; must enroll for 4 credits)

GER 370	German Studies in English	
GER 371	The Holocaust in Text, Image, and Memory	
GER 375	Grimms' Tales	
GER 378	German Film and Media Studies	

### GERMAN MINORS

#### Minor in German (17 credits)

The Minor in German Studies requires at least 17 credits of courses taught in German. At least 9 credits must be 300-level German courses, 3 credits of which must be chosen from GER 320 and 330.

GER 201	Intermediate German I	4
GER 202	Intermediate German II	4
3 credits must be in literature or culture taught in German		3
GER 320	Germany Today	
or GER 330	German Literature and Culture	
6 additional credits from the following		6
GER 301	Reading	
GER 302	Composition	

GER 304	German for Global Professionals
GER 305	Conversation
GER 320	Germany Today
GER 330	German Literature and Culture

Note: Courses taught primarily in English (German 370, 371, 375, 378, and 476) cannot count toward the German minor.

### Minor in German LCP (Language and Cultures for Professions) (17 credits)

Students who complete a Minor in German LCP (Languages and Cultures for Professions) seek to become culturally-competent global professionals and engage in language and cultural training. The German LCP Minor requires at least 17 credits of courses taught in German. At least 9 credits must be 300-level German courses, including the required course GER 304.

GER 201	Intermediate German I	4
GER 202	Intermediate German II	4
GER 304	German for Global Professionals	3
6 additional credits from the following		6
GER 301	Reading	
GER 302	Composition	
GER 305	Conversation	
GER 320	Germany Today	
GER 330	German Literature and Culture	

Note: Courses taught primarily in English (German 370, 371, 375, 378, and 476) cannot count toward the German LCP Minor.

A listing of all German Coursework is available in the A-Z course list.

## Italian (ITAL)

The Department of World Languages and Cultures offers coursework in Italian. There are no minors or major options.

A listing of Italian Coursework is available in the A-Z course list and below.

### ITAL 107: Intensive Beginning Italian

Cr. 4. F.S.

A communicative approach to grammar and vocabulary within the context of Italian culture for students whose native language is not Italian. Taught in Italian.

## Latin (LATIN)

The Department of World Languages and Cultures offers coursework in Latin. There are no minors or major options.

For courses in Latin literature taught in English, see Classical Studies.

A listing of Latin Coursework is available in the A-Z course list and below.

## Courses primarily for undergraduate students

### LATIN 101: Elementary Latin I

(3-0) Cr. 3. F.

Grammar and vocabulary of classical Latin, within the context of Roman culture; reading knowledge through texts adapted from classical authors.

### LATIN 102: Elementary Latin II

(3-0) Cr. 3. S.

*Prereq: LATIN 101*

Grammar and vocabulary of classical Latin, within the context of Roman culture; reading knowledge through texts adapted from classical authors. Meets International Perspectives Requirement.

### LATIN 490: Independent Study

Cr. 1-6. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in LATIN; Permission of Department Chair*

Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 9 credits in Latin 490 may be counted toward graduation.

## Portuguese (PORT)

The Department of World Languages and Cultures offers coursework in Portuguese. There are no minors or major options.

A listing of Portuguese Coursework is available in the A-Z course list and below.

## Courses primarily for undergraduate students

### PORT 101: Elementary Portuguese I

Cr. 4.

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture.

### PORT 102: Elementary Portuguese II

Cr. 4.

*Prereq: PORT 101*

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture. Meets International Perspectives Requirement.

### PORT 111: Intensive Beginning Portuguese

Cr. 3.

A communicative approach to grammar and vocabulary within the context of Luso-Brazilian culture for students whose native language is not Portuguese. Taught in Portuguese.

**PORT 112: Elementary Portuguese, Accelerated II**

Cr. 3.

*Prereq: PORT 111*

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture.

Meets International Perspectives Requirement.

**PORT 375: Brazil Today**

Cr. 3. F.

A survey of social, political, economic, and cultural topics relevant to contemporary Brazil. Includes an introduction to Portuguese language.

Meets International Perspectives Requirement.

## Russian

### Minor in Russian Studies

The Minor in Russian Studies requires 17 credits, 9 of which must be at the 300 level or higher.

RUS 201	Intermediate Russian I	4
RUS 202	Intermediate Russian II	4
9 credits must be at the 300 level and above, including at least 3 credits in the Russian curriculum (courses taught in English or Russian).		9
RUS 301	Composition and Conversation	
RUS 304	Russian for Global Professionals	
RUS 314	Reading Russian Literary and Cultural Texts	
RUS 370	Russian Studies in English Translation	
RUS 370A	Russian Studies in English Translation: Topics in Russian Literature	
RUS 370B	Russian Studies in English Translation: Russian Fairy Tales	
RUS 370R	Studies in English Translation: Russian Topics on Women or Feminism	
RUS 375	Russia Today	
RUS 378	Russian Film Studies in English	
RUS 395	Study Abroad	
RUS 499	Internship in Russian	
RUS 590	Special Topics in Russian	
HIST 421	History of Russia I	
HIST 422	History of Russia II	
HIST 530	Readings Seminar in Modern Russian/Soviet History	
POL S 349	Politics of Russia and Eastern Europe	

### Minor in Russian Studies LCP (Languages and Cultures for Professions)

The Minor in Russian Studies LCP requires 17 credits.

Required Core Courses		11
RUS 201	Intermediate Russian I	
RUS 202	Intermediate Russian II	
RUS 304	Russian for Global Professionals	
Electives		6
RUS 301	Composition and Conversation	
RUS 314	Reading Russian Literary and Cultural Texts	
RUS 370	Russian Studies in English Translation	
RUS 370A	Russian Studies in English Translation: Topics in Russian Literature	
RUS 370B	Russian Studies in English Translation: Russian Fairy Tales	
RUS 370R	Studies in English Translation: Russian Topics on Women or Feminism	
RUS 375	Russia Today	
RUS 378	Russian Film Studies in English	
RUS 395	Study Abroad	
RUS 490	Independent Study	
RUS 499	Internship in Russian	
RUS 590	Special Topics in Russian	
HIST 421	History of Russia I	
HIST 422	History of Russia II	
HIST 530	Readings Seminar in Modern Russian/Soviet History	
POL S 349	Politics of Russia and Eastern Europe	

A listing of all Russian Coursework is available in the A-Z course list.

## Spanish

### World Languages and Cultures, B.A., Spanish (Hispanic Studies) Option

See World Languages and Cultures, B.A. for general requirements.

Students with a concentration in Spanish must complete a minimum of 30 credits beyond the intermediate level (SPAN 201 Intermediate Spanish I & SPAN 202 Intermediate Spanish II).

Hispanic Studies Required Core Courses (9 credits)

SPAN 303A	Spanish Conversation and Composition: through Culture	3
or SPAN 303B	Spanish Conversation and Composition: for Professionals	
SPAN 314	Textual and Media Analyses	3



SPAN 352	Spanish Pronunciation	3
Additional Courses: Students must take at least 15 credits chosen from A, B, and C below (minimum 3 credits from each).		15

A) At least 3 credits of literary studies chosen from the following:

SPAN 330	Studies in Spanish Literature
SPAN 332	Studies in Latin American Literature

B) At least 3 credits of cultural studies chosen from the following:

SPAN 304	Spanish for Global Professionals
SPAN 321	Spanish Civilization
SPAN 322	Latin American Civilization
SPAN 323	Spain Today
SPAN 324	Latin America Today
SPAN 325	Culture and Community: Iowa and Midwest Latino/as
SPAN 326	Studies in Hispanic Art or Film

C) At least 3 credits of applied language and linguistics chosen from the following:

SPAN 302A	Mini-Modules for Global Professionals: Tourism and Hospitality
SPAN 302B	Mini-Modules for Global Professionals: Health and Medicine
SPAN 302C	Mini-Modules for Global Professionals: Criminal Justice and the Law
SPAN 305	Spanish for Heritage Speakers
SPAN 351	Introduction to Spanish-English Translation
SPAN 354	Introduction to Spanish-English Interpretation
SPAN 401	Advanced Composition and Grammar
SPAN 462	Contrastive Analysis of Spanish/ English for Translators
SPAN 463	Contemporary Spanish Linguistics
SPAN 499	Internship in Spanish

Students may apply up to 6 credits of SPAN 395 Study Abroad to section A, B, or C above (appropriate section based upon course content and assigned by the WLC advisor).

Students must take at least 6 credits of language, literature and/or culture at the 400 level, chosen from the following (each repeatable to 6 credits):

SPAN 440	Seminar on the Literatures and Cultures of Spain	6
SPAN 441	Seminar on Cervantes and the Golden Age	
SPAN 445	Seminar on the Literatures and Cultures of Latin America	
SPAN 463	Contemporary Spanish Linguistics	

Approved study abroad in a Spanish-speaking country or completion of an additional course from the approved options. 0-3

**Study Abroad:** The department strongly recommends that all students of Spanish participate in an approved study abroad program based in a Spanish-speaking country. Any student pursuing the World Languages and Cultures Major, Spanish (Hispanic Studies) Option who chooses not to participate in a department-approved study abroad program will be required to take 3 additional elective credits of Spanish at or above the SPAN 321 level (for a total of 33 credits beyond the intermediate 201-202 level).

## Language Teacher Preparation Option

EDUC 487	Methods in Secondary School World Language Instruction (same as WLC 487 & LING 487)	3
or ENGL 318	Introduction to ESL methods and materials	
PSYCH 230	Developmental Psychology	3
POL S 111	Introduction to American Government (or a course in U.S. History)	3

Additional requirements of the Secondary Major in Education. See footnote for catalog link to requirements. <sup>TP</sup>

TP Students preparing to teach a language declare the Secondary Major in Education and complete the additional course requirements.

## World Languages and Cultures Additional Major, Spanish (Hispanic Studies) Option

The requirements for the World Languages and Cultures Additional Major with the Spanish (Hispanic Studies) Option are the same as the major requirements for the primary major listed above.

## World Languages and Cultures Additional Major, Spanish Language and Cultures for Professions (LCP) Option

Students who complete an additional major in World Languages and Cultures with LCP Option seek to become culturally-competent global professionals and engage in language and cultural training. Note: Students may only enroll in the Spanish Languages and Cultures for Professions (LCP) Option as an additional major; they may not graduate with this as a primary major.

Students must complete a minimum of 30 credits beyond the intermediate level (SPAN 201 Intermediate Spanish I & SPAN 202 Intermediate Spanish II).

A. Required LCP Core Courses: (12 Credits)

SPAN 303B	Spanish Conversation and Composition: for Professionals	3
SPAN 304	Spanish for Global Professionals	3
SPAN 351	Introduction to Spanish-English Translation	3

SPAN 499	Internship in Spanish *	3
or SPAN 395	Study Abroad	

#### B. Literature and Culture Courses: (9 Credits)

SPAN 314	Textual and Media Analyses	3
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SPAN 323	Spain Today	3
or SPAN 321	Spanish Civilization	

SPAN 324	Latin America Today	3
or SPAN 322	Latin American Civilization	

#### C. Additional Courses: Select one course from each of the following two categories (6 credits)

##### Category 1:

SPAN 330	Studies in Spanish Literature	3
or SPAN 332	Studies in Latin American Literature	

##### Category 2:

SPAN 440	Seminar on the Literatures and Cultures of Spain	3
or SPAN 441	Seminar on Cervantes and the Golden Age	
or SPAN 445	Seminar on the Literatures and Cultures of Latin America	
or SPAN 463	Contemporary Spanish Linguistics	

D. Additional 3 credits taken at the SPAN 300-level or higher.	3
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\*Additional credit from an approved study abroad program may be applied to the major.

## SPANISH MINORS

### Minor in Spanish (Hispanic Studies)

The Minor in Spanish (Hispanic Studies) requires at least 15 credits, 12 of which must be at the 300 level or higher. The department strongly recommends that all students of Spanish participate in an approved study abroad program based in a Spanish-speaking country. Any student who chooses not to participate in a department-approved study abroad program will be required to take 3 additional elective credits of Spanish at the 300 level or higher.

### Minor in Spanish LCP (Language and Cultures for Professions)

Students who complete a Minor in Spanish (Languages and Cultures for Professions) seek to become culturally-competent global professionals and engage in language and cultural training. The minor requires the following 15 credits:

SPAN 303B	Spanish Conversation and Composition: for Professionals	3
SPAN 304	Spanish for Global Professionals	3
SPAN 351	Introduction to Spanish-English Translation	3
One of the following		3

SPAN 321	Spanish Civilization	
or SPAN 322	Latin American Civilization	
or SPAN 323	Spain Today	
or SPAN 324	Latin America Today	

Approved study abroad in a Spanish-speaking country or completion of an additional course from the approved options.	3
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### Minor in Spanish Translation and Interpretation Studies

The minor in Translation and Interpretation requires the following 15 credits.

SPAN 303B	Spanish Conversation and Composition: for Professionals	3
or SPAN 304	Spanish for Global Professionals	
or SPAN 305	Spanish for Heritage Speakers	

SPAN 351 & SPAN 354	Introduction to Spanish-English Translation and Introduction to Spanish-English Interpretation	6
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Choose two of the following courses (6 credits)	6
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SPAN 352	Spanish Pronunciation	
SPAN 462	Contrastive Analysis of Spanish/ English for Translators	
SPAN 463	Contemporary Spanish Linguistics	

Transfer credit accepted at ISU or credit earned on an ISU-approved study abroad program can apply toward the minor. The minor is intended for students pursuing or holding a baccalaureate degree at ISU and open to any student with proficiency in Spanish that would place them into the 300-level.

## STUDY ABROAD ALTERNATIVES

The department strongly recommends that all students of Spanish participate in an approved study abroad program based in a Spanish-speaking country. For programs that allow an additional course instead of study abroad, any student who chooses not to participate in a department-approved study abroad program will be required to take 3 additional credits in culture chosen from the following:

SPAN 321	Spanish Civilization	3
SPAN 322	Latin American Civilization	3
SPAN 323	Spain Today	3
or SPAN 324	Latin America Today	

Students taking either SPAN 321 or SPAN 323 Spain must take either SPAN 322 or SPAN 324; students taking either SPAN 322 or SPAN 324 must take either SPAN 321 or SPAN 323.

A listing of all Spanish Coursework is available in the A-Z course list.

# PLACEMENT POLICIES AND COURSE GUIDANCE

Students who have had formal training in world languages offered at Iowa State may obtain credit by passing appropriate examinations. Students with native fluency in languages taught at Iowa State may not enroll in or take the Exam for Credit in elementary or intermediate courses (100 and 200 level) in their native language. Students are considered to have native fluency if their ethnic first language as indicated on the matriculation form is the language in which they wish to enroll. Students are also considered to have native fluency if they have had substantial attendance at a secondary school or university where the language of instruction is the language in which they wish to enroll at ISU. Students with native fluency may be eligible to enroll in literature and civilization courses in their native language at the 300 level or above; such students must also consult the department office to determine eligibility for advanced composition and conversation courses (300 level and above). Students who have completed three or more years of high-school world language study may not enroll in or receive credit for 101-102 in those languages; credit may be obtained by passing the appropriate Exam for Credit or by completing an advanced sequence (200-level or higher) in that language. Students who complete an approved sequence of courses in a single language at the 200- or 300-level (e.g., 201 and 202 or 301 and 302) with a grade of C- or higher are eligible to receive credit for 101 and 102 in that same language if they have not received credit for a 101 or 102 course in the language. Students who complete a 102 course with a grade of C- or higher are eligible to receive credit for 101 in that same language if they have not received credit for 101 in the same language. Students should contact the department after completion of the course sequence to receive credit. Courses in the 101-102 level may not be taken on a remedial basis.

Students who have completed two years but less than three years of a single high-school world language may not enroll in a 101 course in that language. These students may enroll in either a 102 course in that language, or in the case of Spanish, SPAN 097 Accelerated Spanish Review. Before enrolling in either SPAN 097 Accelerated Spanish Review or a 102 language course, students are recommended to take the on-line placement test available at [www.language.iastate.edu](http://www.language.iastate.edu) (<http://www.language.iastate.edu>). After completing the online placement test, students who believe that they have extenuating circumstances may appeal to the Department of World Languages and Cultures in order to request enrollment in a 101 language course.

SPAN 097 Accelerated Spanish Review is designed for students who need additional work in the language at the first-year level (101-102) and are not planning to continue their language study at the second-year 201-202 level. Students who complete with a passing grade will have fulfilled the LAS world language requirement. Students who have

completed SPAN 097 Accelerated Spanish Review and wish to pursue further study in Spanish at the 201-202 level may enroll in 102.

Students with disabilities who need to satisfy the world language requirement may direct questions to their academic advisor, the Department of World Languages and Cultures, or the Disability Resources Office.

Credit by examination in the Department of World Languages and Cultures for courses numbered 101, 102, 201, and 202 is available only to students who are not currently enrolled in the course. Credit by examination for other courses in the Department is not normally available.

Language and literature courses numbered 300 and above are principally taught in the target language; courses numbered in the 270s, 370s, and 470s are taught in English. For courses taught in English about Ancient Greek and Rome, see Classical Studies. Students may not take intermediate (200 level) courses for credit after successfully completing any advanced (300/400 level) course, except those in the 370 series or courses taught in English translation. Students who have successfully completed any course in the intermediate (200 level) sequence may not take a lower-numbered course in that sequence for a grade.

## STUDY ABROAD

The Department also offers faculty-led summer study abroad programs in Costa Rica, France, Germany, Greece, Italy, and Spain; and semester study abroad programs in Spain. Programs and exchanges in other areas of the world are offered through study abroad providers. Information concerning these programs can be obtained directly from the Department.

## World Languages and Cultures B.A - French/German/Spanish Options

Freshman		
Fall	Credits Spring	Credits
ENGL 150	3 Humanities Choice	3
Language 101	4 Language 102	4
Elective	3 Humanities Choice	3
Humanities Choice	3 Natural Science Choice	2
Natural Science Choice	3 Social Science Choice	3
16		15
Sophomore		
Fall	Credits Spring	Credits
Language 201	4 Language 202	4
ENGL 250	3 Humanities Choice	3
LIB 160	1 Social Science Choice	3
Natural Science Choice	3 Elective	3
Social Science Choice	3 Elective	1-2

LAS 203		1
<b>14</b>		<b>15-16</b>
<b>Junior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Language Choice - 300 Level	3 Language Choice - 300 Level	3
Language Choice - 300 Level	3 Language Choice - 300 Level	3
English Proficiency Requirement	3 Language Choice - 300 Level	3
Math Choice	3 Elective	3
Elective	3 Elective	3
<b>15</b>		<b>15</b>
<b>Senior</b>		
<b>Fall</b>	<b>Credits Spring</b>	<b>Credits</b>
Language Choice - 300 or 400 Level	3 Language Choice - 300 or 400 Level	3
Language Choice - 400 Level	3 Language Choice - 400 Level	3
Language Choice - 400 Level	3 Language Choice - 400 Level	3
Electives	6 Electives	6
<b>15</b>		<b>15</b>

**Total Credits: 120-121**

## Graduate Programs

### Graduate Minor in Spanish

The Department of World Languages and Cultures offers course work leading to a graduate minor in Spanish. The graduate minor is designed to provide an opportunity for graduate students to further their knowledge of Spanish to complement work in their major disciplines and provides formal recognition of student achievement and expertise.

#### Prerequisites

Graduate students who wish to minor in Spanish must have 400-level proficiency in Spanish. When this is not the case, the student may be required to take a language course below the 400-level, which would not count towards the graduate minor requirements.

#### Course Requirements

For the M.A. or M.S.: Three courses in Spanish. No more than three credits may be in courses numbered 401, 402, and 403.

For the Ph.D.: Four courses in Spanish must include at least one three credit course at the 500 level. No more than three credits may be in courses numbered 401, 402, or 403.

At least two courses for the M.A. and the Ph.D. minors must be taken in residence at Iowa State University. Papers written for these courses are expected to have a content and depth commensurate with the graduate status of the student.

#### Courses primarily for undergraduates:

##### WLC 107: Introduction to Swahili

Cr. 1. Alt. S., offered irregularly.

Basics of grammar and vocabulary within the context of the cultures where Swahili is spoken. For students whose native language is not Swahili. Taught in Swahili. Offered on-line. No

##### WLC 119: Introduction to World Languages

(Cross-listed with LING). (3-0) Cr. 3.

Study of language diversity and the personal, social and political effects of diversity. Language families, attitudes toward language and language use, language and culture, multilingualism, foreign language learning, written codes, official languages, and language policy. Meets International Perspectives Requirement.

##### WLC 205: World Religions

(Cross-listed with RELIG). (3-0) Cr. 3. F.S.SS.

An introduction to religious studies – the academic study of religion. Religions from around the world will be discussed, including their myths, rituals, beliefs, values, and social forms. Meets International Perspectives Requirement.

##### WLC 210: Introduction to Asian American Studies

(Cross-listed with ANTHR). (3-0) Cr. 3.

An interdisciplinary and chronological examination of Asian American immigration experiences from the early 19th century to the 21st century. Focus on how these immigration histories are accompanied by changing racial constructions. Discussion of racial stereotyping, the model minority myth, identity development, and efforts for social justice.

Meets U.S. Diversity Requirement

##### WLC 270: Cultures in Transition

(3-0) Cr. 3.

An interdisciplinary introduction to a world region in a state of rapid social and cultural transition. Discussion of the history, social and political institutions, arts, economy, agriculture, and environment of the new nations.

Meets International Perspectives Requirement.

##### WLC 352: Religions of India

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

Study of texts, practices, beliefs, historical development, and mutual influence of a variety of the religious traditions of India. Emphasis on Vedic religion and the diversity of traditions of Classical Hinduism; survey of Buddhist, Jain, Sikh, and South Asian Islamic traditions.

Meets International Perspectives Requirement.

**WLC 358: Islam**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

An introduction to Islamic religion, culture, and society from its origins to the present. Topics include the Quran, the Prophet Muhammad, Islamic theology and philosophy, Islamic history, and Islam in America.

Meets International Perspectives Requirement.

**WLC 359: The Quran**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

A study of the Quran, the sacred text of Islam, with attention to its history, its major themes, and the diverse ways it is interpreted and applied.

Meets International Perspectives Requirement.

**WLC 370: Topics in World Languages and Cultures in English Translation**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370A: Topics in World Languages and Cultures in English****Translation: Global Sustainability**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370B: Topics in World Languages and Cultures in English****Translation: Middle East**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370C: Topics in World Languages and Cultures in English****Translation: Global Urban Cultures**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 417: Student Teaching**

Cr. 8-12. F.S.

*Prereq: Minimum cumulative GPA of 2.5; Department Permission*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences. Admission to teacher education required.

**WLC 417G: Student Teaching: World Language**

(Dual-listed with WLC 517G). (Cross-listed with EDUC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**WLC 484: Technology, Globalization and Culture**

(Dual-listed with WLC 584). (Cross-listed with M E, MKT). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**WLC 486: Methods in Elementary School World Language Instruction**

(Cross-listed with EDUC, LING). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language*

Planning, implementation, and assessment of standards-based, student-centered, and thematic instruction in the elementary (K-8) classroom.

Special emphasis on K-8 students' communicative skills, cultural knowledge, and content learning.

**WLC 487: Methods in Secondary School World Language Instruction**

(Cross-listed with EDUC, LING). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language; Department Permission*

Theories and principles of contemporary world language learning and teaching. Special emphasis on designing instruction and assessments for active learning. Admission to teacher education required.

**WLC 491: Experiences Abroad: Learning to Think Globally**

(Cross-listed with INTST). (1-0) Cr. 1. Repeatable, maximum of 2 credits.

*Prereq: Minimum of 3 credits of study abroad and/or internship abroad*

Students returning from study abroad gain perspective on the personal, academic, and professional impact of their time spent abroad through readings and discussions. Students will be expected to make one presentation about the culture they experienced to an audience outside ISU. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**WLC 517G: Student Teaching: World Language**

(Dual-listed with WLC 417G). (Cross-listed with EDUC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**WLC 584: Technology, Globalization and Culture**

(Dual-listed with WLC 484). (Cross-listed with M E, MKT). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.



# INTERDISCIPLINARY PROGRAMS

Interdepartmental programs are available at both graduate and undergraduate levels. An interdepartmental program is an administrative structure usually not functioning as a department, ordinarily headed by a supervisory committee, and offering a degree with major(s) in that subject area. Interdepartmental programs have been officially approved and may offer courses.

See individual programs for information regarding admission and academic requirements.

## Cyber Security INTERDEPARTMENTAL GRADUATE MAJOR

Iowa State University has been offering courses in cyber security since 1995 and has one of the largest programs in the country. Graduate degrees can be obtained in a traditional on campus setting or as an on-line program. For information about the online Cyber Security program visit Iowa State Online (<https://iowastateonline.iastate.edu/>).

Students graduating from the major will help to fill the need for well-educated system security specialists in the government, private sector, and academia. The program objectives identified as being critical to the accomplishment of this mission are:

- 1. Impart and enhance knowledge about information infrastructure security
- 2. Expand and develop the ability to engineer complex systems
- 3. Instill and nurture social awareness, and the ability to function in a team
- 4. Instill and nurture a sense of ethics
- 5. Develop an understanding of strategic and policy issues

We offer 4 different graduate degree options:

- 1. Masters of Science with thesis
- 2. Masters of Science without thesis
- 3. Masters of Engineering (coursework only)
- 4. Graduate certificate

## Graduate Certificate

A graduate certificate in Cyber Security is offered, which consists of four courses (12 credits): The graduate certificate is targeted for off-campus students as a way to either supplement their education or as way to try out online education courses. All of the certificate courses will transfer into the MS or MENG degree in Cyber Security.

for Certificate in Cyber Security		
CYBSC 530	Network Protocols and Security	3
CYBSC 531	Information System Security	3
CYBSC 532	Information Warfare	3
CYBSC 533	Cryptography	3
	or CYBSC 535 Steganography and Digital Image Forensics	
	or CYBSC 534 Legal and Ethical Issues in Cyber Security	
	or CYBSC 536 Computer and Network Forensics	
	or CPR E 537 Wireless Network Security	
Total Credits		12

For additional information students should visit <https://www.cyio.iastate.edu/>. (<http://www.iac.iastate.edu>)

## Master of Science with & without thesis

The degree Master of Science with a major in Cyber Security is under a cooperative arrangement with various home departments including Electrical and Computer Engineering, Political Science, Information Systems and Business Analytics, and Mathematics.

The degree Master of Science with thesis is recommended for students who intend to continue toward the Doctor of Philosophy degree or to undertake a career in research and development. The non-thesis Master of Science degree requires a creative component and is intended for students interested in a career in cybersecurity.

Students interested in the interdepartmental major apply and are admitted to both a home department (the department that is most closely aligned with the student's research interest and background) and to the program. The home department sets the admission standards, course requirements, and thesis standards. (**Note:** Electrical and Computer Engineering is the only home department for off-campus students pursuing the Master of Science in Cyber Security).

The program is broadly based and uses courses in the various departments. The program will consist of 24 course credits with 6 credits of research work for a Master of Science with thesis. A non-thesis Master of Science will consist of 27 credits of courses and 3 credits of creative component. The courses are divided into three categories: core, electives, and thesis research. A student's Program of Study Committee, in consultation with the student, determines the elective courses to be taken and the acceptability of transfer credits. The major professor will be selected from the discipline where the student is admitted (home department).

The basic prerequisite for admission to this program is a baccalaureate degree in engineering, mathematics, computer science, management information systems, political science, or closely related field. The GRE or GMAT examination may be required based on the standards of the home

department. If the GRE or GMAT is not required it will be considered in admissions decisions if offered. Potential students with baccalaureate degrees in the physical sciences, statistics, or other related fields will be considered on an individual basis, possibly with provisional admission.

## Master of Engineering

The Master of Engineering (MENGR) in Cyber Security degree is only offered to off-campus students. This program is designed to assist all individuals who already have a bachelor's degree in computing or related areas to pursue an in-depth study in information assurance. The Master of Engineering program is based on coursework credits only (a thesis or creative component is not required). Courses are offered via digital streaming video. (**Note:** Electrical and Computer Engineering is the only home department for the Master of Engineering in Cyber Security).

A coursework only Master of Engineering degree in Cyber Security consists of 30 credits. The courses are divided into two categories: core and electives. (**Note:** Students pursuing the MENGR do not have a program of study committee and the major professor is the Cyber Security, Director of Graduate Education (DoGE)

Students interested in the MENGR in Cyber Security degree apply and are admitted to Cyber Security (CYBSC) with ECpE as the home department.

The admission requirements for students entering the program without work experience are the same as the admission requirements for the ECpE department. For students with 3 or more years of work experience in a computer related position the GRE and GPA minimum may be waived.

Students with an undergraduate degree in a non computing field that have at least 3 years of work experience in an information technology field may be admitted to the program.

### Courses primarily for undergraduates:

#### CYBSC 131: Introduction to Computer Security Literacy

(Cross-listed with CPR E). (1-0) Cr. 1.

Basic concepts of practical computer and Internet security: passwords, firewalls, antivirus software, malware, social networking, surfing the Internet, phishing, and wireless networks. This class is intended for students with little or no background in information technology or security. Basic knowledge of word processing required. Offered on a satisfactory-fail basis only.

#### CYBSC 332: Cyber Defense Competition

(Cross-listed with CPR E). (0-2) Cr. 1. Repeatable. S.

Participation in cyber defense competition driven by scenario-based network design. Includes computer system setup, risk assessment and implementation of security systems, as well as defense of computer and network systems against trained attackers. Team based. Offered on a satisfactory-fail basis only.

#### CYBSC 430: Network Protocols and Security

(Dual-listed with CYBSC 530). (Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq:* CPR E 308 OR COM S 252 OR COM S 352. *E E students:* CPR E 288.

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

### Courses primarily for graduate students, open to qualified undergraduates:

#### CYBSC 530: Network Protocols and Security

(Dual-listed with CYBSC 430). (Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq:* CPR E 308 OR COM S 252 OR COM S 352. *E E students:* CPR E 288.

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

#### CYBSC 531: Information System Security

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq:* CPR E 489 or CPR E 530 or COM S 586 or MIS 535

Computer, software, and data security: basic cryptography, security policies, multilevel security models, attack and protection mechanisms, legal and ethical issues.

#### CYBSC 532: Information Warfare

(Cross-listed with CPR E). (3-0) Cr. 3. S.

*Prereq:* CPR E 430 or 530

Computer system and network security: implementation, configuration, testing of security software and hardware, network monitoring. Authentication, firewalls, vulnerabilities, exploits, countermeasures. Study and use of attack tools. Ethics in cyber security. Emphasis on laboratory experiments.

#### CYBSC 533: Cryptography

(Cross-listed with CPR E, MATH). (3-0) Cr. 3. S.

*Prereq:* MATH 301 or CPR E 310 or COM S 230

Basic concepts of secure communication, DES and AES, public-key cryptosystems, elliptic curves, hash algorithms, digital signatures, applications. Relevant material on number theory and finite fields.

#### CYBSC 534: Legal and Ethical Issues in Cyber Security

(Cross-listed with CPR E, POL S). (3-0) Cr. 3. S.

*Prereq:* Graduate classification; CPR E 531 or CYBSC 531

Legal and ethical issues in computer security. State and local codes and regulations. Privacy issues.

**CYBSC 535: Steganography and Digital Image Forensics**

(Cross-listed with CPR E, MATH). (3-0) Cr. 3. S.

*Prereq: E E 524 or MATH 317 or MATH 407 or COM S 230*

Basic principles of covert communication, steganalysis, and forensic analysis for digital images. Steganographic security and capacity, matrix embedding, blind attacks, image forensic detection and device identification techniques. Related material on coding theory, statistics, image processing, pattern recognition.

**CYBSC 536: Computer and Network Forensics**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Fundamentals of computer and network forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anonymity and pseudonymity, privacy-protection techniques, cyber law, computer security policies and guidelines, court testimony and report writing, and case studies. Emphasis on hands-on experiments.

**CYBSC 538: Reverse Engineering and Security Testing**

(Cross-listed with CPR E). (2-3) Cr. 3. S.

*Prereq: COM S 321 or CPR E 381, COM S 352 or CPR E 308*

Techniques and tools for understanding the behavior of software/hardware systems based on reverse engineering. Flaw hypothesis, black, grey, and white box testing as well as other methods for testing the security of software systems. Discussion of counter-reverse engineering techniques.

**CYBSC 560: Data-Driven Security and Privacy**

(Cross-listed with COM S, CPR E). Cr. 3. Alt. S., offered irregularly.

*Prereq: CPR E 531; COM S 474 or COM S 573*

Examination of applications of machine learning and big data techniques to various security and privacy problems, as well as secure and privacy-preserving machine learning algorithms.

**CYBSC 592: Seminar in Cyber Security**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Projects or seminar in Cyber Security.

**Courses for graduate students:****CYBSC 631: Cyber Security Operations Practicum**

(Cross-listed with CPR E). Cr. 3. Repeatable.

*Prereq: CPR E 532; CPR E 534; and permission of instructor*

Practical experience in cyber operations. Cyber security threat analysis, malware analysis, and intrusion detection management. Cyber security data analysis methods. Pen testing tools and techniques. Weekly threat analysis briefings. Offered on a satisfactory-fail basis only.

**CYBSC 632: Cyber Security Capstone Design**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CYBSC 531, CYBSC 532, CYBSC 534*

Capstone design course which integrates the security design process. Design of a security policy. Creation of a security plan. Implementation of the security plan. The students will attack each other's secure environments in an effort to defeat the security systems. Students evaluate the security plans and the performance of the plans. Social, political and ethics issues. Student self-evaluation, journaling, final written report.

**CYBSC 634: Current Research Problems in Cyber Security**

(3-0) Cr. 3. Repeatable. F.S.

*Prereq: CPR E 530, CPR E 531, permission of instructor.*

Discussion of complex cyber security problems. Students will learn how to apply research techniques, think clearly about these issues, formulate and analyze potential solutions, and communicate their results. Working in small groups under the mentorship of technical clients from government and industry, each student will formulate, carry out, and present original research on complex current cybersecurity problems of interest to the nation. This course will be run in a synchronized distance fashion, coordinating some activities with our partner schools and our technical clients.

**CYBSC 697: Cyber Security Summer Internship**

Cr. R.

*Prereq: Permission of department, graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

## Dietetics - Graduate Program

### INTERINSTITUTION GRADUATE PROGRAM

Iowa State University offers a master's degree in Family and Consumer Sciences with a specialization in Dietetics. This is an interinstitutional online program offered through the Great Plains Interactive Distance Education Alliance (or GPIDEA). The student selects a home institution (Iowa State), which ultimately grants the degree. After admission to Iowa State, the student takes courses from Iowa State and the other participating institutions: Colorado State University, North Dakota State University, Oklahoma State University, South Dakota State University, University of Kansas Medical Center, and University of Nebraska-Lincoln.

The Master of Family and Consumer Sciences-Dietetics is designed for the Registered Dietitian or Registration-eligible Dietitian. The 36-credit program is non-thesis and seeks to develop research skills, stimulate independent thought, and provide up-to-date knowledge in foods, nutrition, and foodservice/business management. A special project, called a creative component, is required as part of the 36 required credits. This program prepares individuals to integrate and apply the principles

from the biomedical sciences, human behavior, and management to design and lead effective food and nutrition programs in a variety of settings. Students may build a program of study from offerings of the partner institutions such as human nutrition, nutrient metabolism, biostatistics, health promotion/disease prevention, foodservice systems management, food science, lifespan nutrition, wellness, entrepreneurship, nutrition education, nutritional assessment and food safety. The online program is tailored for credentialed, practicing dietetics professionals who seek to enhance their knowledge in a specific area of dietetics practice or retool for new career opportunities in dietetics practice.

**Admission procedures:** Admission to the MFCS-Diet program requires exactly the same procedures as admission to the Graduate College. See the Graduate College Admission section of this catalog.

**Registration:** Students choosing to receive their degree from Iowa State University complete all the admissions, registration, and fee payment processes through ISU.

**Courses primarily for graduate students, open to qualified undergraduates:**

#### **DIET 511: Research Methods**

(3-0) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

An overview of diverse research approaches focusing on methods for collecting and analyzing quantitative and qualitative data. Only one of DIET 511 or FCEDS 511 may count toward graduation.

#### **DIET 512: Nutritional Epidemiology**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Important issues related to designing, conducting, and interpreting research on the role of diet or physical activity in the development of disease (& health) in human populations.

#### **DIET 526: Obesity Across the Lifespan**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Exploration of the affects that obesity has on public health, the healthcare system, and society in general. Overview of strategies to prevent obesity across the lifespan.

#### **DIET 530: Nutrition and Wellness**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Addresses wellness promotion through nutrition. Nutritional risk and protective factors will be examined in relation to public health and individual nutrition.

#### **DIET 531: Nutrition Therapy for Eating Disorders**

(3-0) Cr. 3. Repeatable. F.

*Prereq: Enrollment in MFCS-Dietetics and a course in medical nutrition therapy or consent of instructor.*

An online study of eating disorders management and nutrition care. Topics include eating disorders medical complications, clinical care guidelines, basic pharmacology, clinical nutrition education, nutrition care planning, psychology of eating disorders, team collaboration, and therapeutic modalities for nutrition counseling.

#### **DIET 532: Maternal and Child Nutrition**

(3-0) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Critical examination of behavioral, physiological, and public health issues impacting dietary and nutritional factors that support normal growth and development. Content focuses on early stages of the life cycle: gestation, lactation, infancy, preschool, school age, and adolescence.

#### **DIET 534: Nutrition Education in the Community**

Cr. 3. S.

*Prereq: Enrollment in GPIDEA MFCS in Dietetics*

Principles and practices of teaching individuals and groups to translate nutrition knowledge into action. Emphasis on research in and evaluation of nutrition education.

#### **DIET 538: Nutrition: A Focus on Life Stages**

(3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Explores influence of normal physiological stresses on nutritional needs throughout the life span. Evaluates dietary intake and identification of appropriate community nutrition services in on-line discussions. Specific considerations, such as the influence of age and cultural heritage, are incorporated.

#### **DIET 540: Nutrition and Physical Activity in Aging**

(Cross-listed with GERON). (3-0) Cr. 3. F.

WWW only. Basic physiologic changes during aging and their impacts in health and disease. The focus will be on successful aging with special emphasis on physical activity and nutrition. Practical application to community settings is addressed.

#### **DIET 541: Food Culture**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Survey of topics that affect how we perceive food in the modern world. Food is examined as a badge of cultural identity, focus of media scrutiny and promotion, symbol of religion, and driver of technology.

**DIET 546: Phytochemicals**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Overview of phytochemicals (non-nutritive biologically active compounds) from fruits, vegetables, cereals and oilseeds. Covers recent findings of chemistry, physiological functions, and potential health implications of phytochemicals.

**DIET 547: Functional Foods in Chronic Disease Prevention**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examination of nutritional science, food science, regulatory principles, and nutrient metabolism to understand and explain functional foods, nutraceuticals, and dietary supplements. Additionally students will evaluate the biochemical basis, technologies, legal requirements, and clinical assessment in the marketplace.

**DIET 548: Nutrition and Physical Activity Assessment**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Introduction to a variety of nutrition and physical activity assessment tools. Opportunity to discuss the strengths and weaknesses of different tools and gain experience collecting, analyzing, and interpreting nutrition and physical activity data.

**DIET 551: Advanced Nutrition: Nutrigenomics, Nutrigenetics & Advanced Lipid Metabolism in Human Nutrition**

Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Exploration and integration of topics and ideas that are at the forefront of the field of nutritional science. Examination of topics that are new and/or controversial and have implications that range from the cellular/molecular/biochemical level up to clinical/educational level. Emphasis on the integrative and complex nature of human nutrition research from basic science to clinical studies to population studies and dietary recommendations.

**DIET 554: Statistics**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Tools used to make statistical decisions. Major emphasis on explanation and understanding of important concepts involved; basic theme is understanding of data and methods used to analyze such data. Only one of DIET 554 or Stat 401, 495, 542 may count toward graduation by students in the GPIDEA Dietetics program.

**DIET 555: Public Health Nutrition**

Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examines U.S. public health and nutrition concerns in diverse U.S. populations, examines nutritional status in communities, looks at health communication, and considers nutrition policies and community-based nutrition interventions. Students explore roles of dietitians, nutritionists, and others in developing and delivering nutrition policies and interventions in U.S. communities.

**DIET 556: Micronutrients in Human Nutrition**

(3-0) Cr. 3. S.SS.

*Prereq: BBMB 404 or BBMB 420 or equivalent; enrollment in GP-IDEA MFCS in Dietetics*

Interrelationships of micronutrients in terms of biochemistry, physiology, genetics, and nutrition. Emphasis on developing understanding of how the coordination of structure and function is related to metabolic needs of the cell and its response to the environment. This integrated approach forms the basis for evaluating the micronutrient needs of humans in both normal and altered metabolic states. Only one of DIET 556 or NUTRS 502 may count toward graduation.

**DIET 558: Advanced Human Nutrition: Macronutrients**

(3-0) Cr. 3. SS.

*Prereq: BBMB 404 or BBMB 420 or equivalent; enrollment in GP-IDEA MFCS in Dietetics*

Integration of the molecular, cellular and physiological aspects of macronutrients and energy metabolism in mammalian systems. Dietary energy, carbohydrates, fiber, lipids, proteins, their interactions, metabolic consequences, and major research methodologies. Only one of DIET 558 or NUTRS 501 may count toward graduation.

**DIET 560: Advanced Medical Nutrition Therapy**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention directed to medical nutrition needs of patients in the treatment of each disease state. Only two of DIET 560 or NUTRS 561, 564 may count toward graduation.

**DIET 565: International Nutrition and World Hunger**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Identification and assessment of malnutrition in low-income countries. Social, cultural, political, economic, and geographic determinants of malnutrition. Protein-energy malnutrition, vitamin and mineral deficiencies. Intervention approaches; international efforts and local sustainability.



**DIET 566: Nutrition Counseling and Education Methods**

(2-2) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**DIET 568: Entrepreneurship Theory and Practice**

(3-0) Cr. 3. Alt. SS., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Definition and discussion of entrepreneurship and its importance to economic and business environment.

**DIET 569: Dietary and Herbal Supplements**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Develop skills to partner with patients in making dietary supplement decisions. Explore the safe, efficacious use of botanicals and supplements in nutritional support of aging, maternal health and wellness. Discussions on supplementation in the prevention and treatment of chronic disease include: arthritis, cancer, cardiovascular, diabetes, digestive, liver and renal disorders.

**DIET 570: Nutrition and Human Performance**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Develop an understanding of nutrition based on knowledge of the biochemical and physiological process and functions of specific nutrients in meeting nutritional requirements. Emphasis on the relationship of optimal nutrition and physical efficiency and performance.

**DIET 571: Foundation of Leadership in Dietetics**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Using leadership theories to develop the fundamental concepts and skills to bridge the gap between theory and practice. Students will be able to successfully evaluate classic and contemporary leadership theories, investigate current leadership trends and identify positive applications in the dietetics community.

**DIET 572: Current Issues or Trends**

(3-0) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Overview of current topics, issues, and trends in dietetics practice.

**DIET 574: Nutrition and Immunology**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Principles and issues related to nutrition and immunology. Impact of nutrients and nutritional status on immune responses. Impact of disease states on nutritional status.

**DIET 576: Diabetes Medical Nutrition Therapy**

Cr. 3.

*Prereq: Course in medical nutrition therapy; enrollment in GP-IDEA MFCS in Dietetics*

An in-depth study of diabetes management with emphasis in nutrition care. Topics will include diabetes pathophysiology, clinical care guidelines, basic pharmacology, clinical nutrition education and counseling strategies, and nutrition care planning.

**DIET 597: Nutritional Aspects of Oncology**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: B.S. in nutrition, dietetics, biology, or related discipline.*

Understanding of basic cancer biology and methodology used to study nutrition and cancer relationships. Using current research as a basis, the role of nutrition in specific cancers will be explored. Students will learn about sources of information for cancer prevention programs, and how to apply this information to clinical patient management.

**DIET 598: Clinical Aspects of Nutrition Support**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Specialized nutrition assessment and support. Review of energy expenditure and substrate utilization in specific disease states. Current Methods for the initiation and management of enteral and parenteral nutrition therapy including access, metabolic and mechanical complications. Evaluation of nutrition support methodology in selected disease states.

**DIET 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

For non-thesis option only.

## Ecology and Evolutionary Biology Interdepartmental Graduate Major

The Ecology and Evolutionary Biology (EEB) interdepartmental major is offered through ten departments -- Agronomy; Ecology, Evolution and Organismal Biology; Entomology; Genetics, Development and Cell Biology; Geological and Atmospheric Sciences; Horticulture; Mathematics; Natural Resource Ecology and Management; Plant Pathology; Statistics, and World Languages and Cultures. Faculty in these departments cooperate to offer courses and direct research leading



to M.S. and Ph.D. degrees with a major in Ecology and Evolutionary Biology.

The EEB major is designed for students interested in the study of mechanisms controlling the composition, structure, and functional processes of ecological systems and the mechanisms that regulate the pattern and rate of evolutionary change within and among species. Applicants should have completed an undergraduate or master of science or arts degree in one of the biological, physical, or mathematical sciences. Applicants also should have taken undergraduate courses in both basic ecology and evolution.

The EEB curriculum includes a core course, seminar courses, and an extended field trip. Cooperating departments provide courses and research opportunities in the following areas:

- Conservation and Restoration Ecology;
- Environmental Statistics, Stochastic Modeling, and Quantitative Ecology and Evolution;
- Evolutionary Ecology;
- Landscape Ecology, Modeling, and Spatial Dynamics;
- Natural Resources Ecology and Management;
- Physiological and Behavioral Ecology;
- Population, Community, and Ecosystems Ecology;
- Population, Quantitative, and Evolutionary Genetics; and
- Systematics, biodiversity, and biogeography.

In addition, offerings are available in the ethics and practice of research in the biological sciences as well as in science communication (both written and oral).

Students majoring in EEB are trained for careers focused on basic or applied ecology and evolutionary biology in a variety of settings, including academia, government, industry, and private organizations. Graduates have a broad understanding of ecology and evolutionary biology, experience designing and conducting research, writing grant proposals, and communicating effectively with scientific colleagues at meetings and through publications.

Information on admission procedures (<https://eeb.iastate.edu/admissions/>), academic requirements (<https://eeb.iastate.edu/academics/>), and faculty research areas (<https://www.eeb.iastate.edu/people/faculty/>) is available on the EEB website (<http://www.eeb.iastate.edu/>).

**Courses primarily for graduate students, open to qualified undergraduates:**

**EEB 511: Conceptual Foundations in Ecology and Evolutionary Biology**  
(3-2) Cr. 4. Alt. F., offered even-numbered years.

*Prereq: Graduate classification*

Introduction to key figures and ideas that have shaped the development of ecology and evolutionary biology. Covers major developments in ecology and evolutionary biology at five levels of biological organization: Genome, Organism, Population, Community, and Ecosystem. Impacts of these developments on current approaches to investigation and argument formulation. Effects of technological advances on the direction of scientific investigations. Introduction to analytical skills important for critical thinking in ecology and evolutionary biology and the impact of accepted lines of scientific reasoning on the objectives and conduct of research, such as explanation and prediction, design of studies as experimentation, and structured or unstructured observation.

**EEB 585: Extended Field Trip**

(1-6) Cr. 2. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Graduate classification, permission of instructor*

Extended field trip to study major terrestrial and aquatic ecosystems. Location and duration vary. Report required.

**EEB 585A: Extended Field Trip: Pre-Trip Lecture**

(1-0) Cr. 1. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Graduate classification, permission of instructor*

Extended field trip to study major terrestrial and aquatic ecosystems. Location and duration vary. Report required.

**EEB 585B: Extended Field Trip: Travel**

(0-6) Cr. 1. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Graduate classification, EEB 585A and permission of instructor.*

Extended field trip to study major terrestrial and aquatic ecosystems. Location and duration vary. Report required.

**EEB 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and permission of instructor*

For students wishing to conduct in-depth study of a particular topic in ecology and evolutionary biology.

**Courses for graduate students:**

**EEB 698: Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Reports and discussion of recent research and literature.

**EEB 699: Research**

Cr. arr. Repeatable. F.S.SS.

Thesis and dissertation research.

# Engineering Management

## Engineering Management Master's Degree

The Engineering Management Program focuses on developing an individual's engineering, science and management skills so they can succeed in a technology driven environment. There is a growing need for engineers that can build multi-disciplinary design teams, then lead those teams to solve technical and business challenges. The Iowa State University Master of Engineering in Engineering Management Program is designed to train leaders who can meet both the technical and managerial challenges in developing modern complex engineered systems. The program can be completed on line or in residence, part-time or full-time.

### Admission Requirements

To be considered for admission, the applicant should have a bachelor's degree in engineering or related field from a college, university, or technical school of recognized standing. Non-engineering backgrounds will be considered on a case-by-case basis. High academic achievement or other persuasive evidence of professional accomplishments is expected for admission to the program. The GRE is not required.

Applicants for admission to this program apply through the ISU Graduate College. Each applicant must submit:

- Application and application fee
- Official academic transcripts
- Three letters of recommendation
- Resume

Applications should be submitted as early as possible before the beginning of the semester for which admission is sought. Individuals may also take up to nine credits at Iowa State as a non-degree seeking student and then transfer them to the program when they are admitted. (<https://iowastateonline.iastate.edu/apply-and-enroll/>)

The Master of Engineering in Engineering Management Program at Iowa State University is focused on supporting working professionals so teaching or research assistantships typically are not available.

### Degree Requirements

Engineering Management Core:

Intro/Core (required first year)

I E 563	Engineering and Systems Management	3
I E 565	Systems Engineering and Analysis	3
Core (required)		
SCM 524	Strategic Process Analysis and Improvement	3
I E 570	Systems Engineering and Project Management	3

MGMT 583	Formulating and Implementing Innovation Strategies	3
ACCT 581	Accounting for Decision Making	3
Electives		
I E 560	Engineering Risk Analysis	3
I E 561	Total Quality Management	3
I E 564	Decision Analysis	3
I E 572	Design and Evaluation of Human-Computer Interaction	3
I E 577	Human Factors	3
I E 581	e-Commerce Systems Engineering	3
CON E 380	Engineering Law	3
FIN 501	Financial Valuation and Corporate Financial Decisions	3
MKT 501	Marketing	3
MGMT 503	Professional Responsibility in Business and Society (One course from any graduate program)	3
One course from any graduate program		3

## Entrepreneurship Minor

Are you a problem-solver, innovator, or change maker? Do you want to make an impact in your community or change the world? By minoring in entrepreneurship, you will sharpen your creative thinking and problem solving skills, develop your entrepreneurial mindset, start your own business, develop a new product, or become an innovator in an established company. The interdisciplinary Entrepreneurship Minor was designed to complement any major area of study by introducing knowledge and skills needed to create value through recognizing and developing opportunities.

## UNIVERSITY-WIDE UNDERGRADUATE MINOR

A minor in entrepreneurship is available to all undergraduate students at ISU. The minor requires at least 15 credits from an approved list of courses, including at least 6 credits in courses numbered 300 or above taken at Iowa State University with a grade of C or higher. The minor must include at least 9 credits that are not used to meet any other department, college, or university requirement. Students must follow college-specific rules in selecting courses. The college representatives to the supervisory committee will be responsible for advising students in their college, and will inform students about the details of the college rules. Students with declared majors have priority over students with declared minors in courses with space constraints.

Non-business students with an Entrepreneurship minor are not permitted to major in Entrepreneurship. Business students interested

in entrepreneurship may choose to major in Entrepreneurship (<https://catalog.iastate.edu/collegeofbusiness/entrepreneurship/#undergraduatemajortext>), or pursue the Entrepreneurship minor.

A student seeking a minor in entrepreneurship must successfully complete a minimum of 15 credits in courses approved for use in the entrepreneurship program, including the following:

Required Courses (6 credits):

ENTSP 310	Entrepreneurship and Innovation	3
ENTSP 313	Feasibility Analysis for New Ventures	3
or ENTSP 320	Corporate Entrepreneurship	
or ENTSP 410	Social Entrepreneurship	

ENTSP 310 Entrepreneurship and Innovation is the introductory course and provides an overview of the entire field.

ENTSP 313 Feasibility Analysis for New Ventures emphasizes developing an idea for a new venture, conducting a feasibility study, researching the potential market, analyzing the competition, and preparing a formal business plan.

ENTSP 320 Corporate Entrepreneurship introduces and examines state-of-the-art approaches to product innovation and technology development in today's large and established organizations.

ENTSP 410 Social Entrepreneurship discusses issues related to the role of social entrepreneurship in helping to solve social problems, including innovation, opportunity recognition, planning and the launch of new non-profit organizations.

Elective Courses (6 credits):

Select TWO entrepreneurship-oriented electives from an approved course list (see below). Students are encouraged to take electives within their major college.

Experiential Learning (3 credits):

Students will engage in the process(es) of entrepreneurship to earn experiential learning credits. Students will either take a course that has been designated as an experiential learning course, or use some other experiential learning activity as the basis to receive credits through an independent study.

Detailed information about the Entrepreneurship minor, the list of approved electives, as well as information about the experiential learning options are available online at: <https://ivybusiness.iastate.edu/entrepreneurship-minor/>

FOR IVY COLLEGE OF BUSINESS STUDENTS ONLY: Students are limited to three business majors/degrees/minors within the Ivy College of Business. This limit is on business majors/degrees/minors only, and

does not apply to multiple majors/degrees/minors taken outside the Ivy College of Business.

## GRADUATE CERTIFICATE

A graduate certificate in Entrepreneurship and Innovation offers post-undergraduate students the opportunity to learn the basics of starting a business. The certificate requires 4 courses (12 credits). The two required core courses are offered online by the Ivy College of Business. Elective courses are available across campus.

The graduate certificate in Entrepreneurship and Innovation focuses on strategies and resources for launching new ventures and helps students understand the role of innovation in entrepreneurship.

This interdisciplinary certificate provides a solid foundation in entrepreneurship and innovation through required core courses ENTSP 566 Entrepreneurship and New Venture Startup and ENTSP 583 Formulating and Implementing Innovation Strategies. At the same time, the program enables students to follow their own interests through electives offered by partners across campus.

For more information about the graduate certificate in Entrepreneurship and Innovation, please visit: <https://ivybusiness.iastate.edu/ei-certificate/>

## CONTACTS

### Entrepreneurship Faculty and Advisors

Faculty and advisors in each college are available to answer questions about the Entrepreneurship minor and course requirements. Please visit the link below for the contact in your college.

<https://ivybusiness.iastate.edu/entrepreneurship-minor/contacts/>

## Feed Technology Minor

The agricultural economy is heavily dependent on feed technology.

The Midwest is one of the largest feed production and grain processing regions in the world. Feed manufacturing is also a global business with a growing demand for qualified technical professionals.

Feed technology includes the areas of grain handling and storage, animal nutrition, feed formulation, feed manufacturing, biosecurity, and feed safety and quality. The Feed Technology minor (15 credits) covers the breadth of all these topics so that you can:

- Understand animal nutrition, feed mill operations management and their application to feed quality, safety, and profitability;
- Identify chemical, biological and physical hazards in grain and feed;
- Know practical ways to monitor, manage and mitigate hazards in grain handling and feed manufacturing facilities; and

- Be familiar with the importance, scope and trends of the global animal feed industry.

The minor requires 15 credits and must include at least 9 credits that are not used to meet any other department, college, or university requirement. Below is the list of courses used in the minor.

TSM 322	Preservation of Grain Quality	3
or A B E 469	Engineering for Grain Storage, Preservation, Handling, and Processing Systems	
TSM 455	Feed Processing and Technology	3
TSM 457	Feed Safety, Ingredient Quality and Analytics	3
AN S 320	Animal Feeds and Feeding	3
AN S 324	Food Processing for Companion Animals	3
<b>Total Credits</b>		<b>15</b>

AN S 219X, if offered, may be substituted for AN S 320.

## Forensic Sciences Certificate

### Forensic Sciences Graduate Certificate

The forensic sciences graduate certificate program complements a program of study at Iowa State University that leads to any graduate degree in an established academic major. The forensic sciences certificate is also recommended for students who wish to strengthen their interdisciplinary skills. Coursework for the certificate is at the graduate level; however, qualified undergraduates may also enroll by admission to the Graduate College as a certificate student for a minimum of one semester. Completion of the certificate is noted on the student's transcript and via a certificate provided by the Registrar.

### Learning Outcomes

Upon completion of the graduate certificate in forensic sciences, students will be:

- Educated in a diverse array of topics that contribute to the interdisciplinary field of forensic science.
- Well informed about the needs for research and development in forensic science.
- Able to propose a research project related to forensic science.
- Informed about forensic science as a career choice.
- Aware of the possibility of offering expertise to law enforcement agencies within the community.
- Aware that forensic sciences can be used as an educational tool in post-graduate capacity as a professor/teacher, parent, or community volunteer.

### Requirements

- 12 credits of coursework and seminars at Iowa State University with a total GPA of 3.0 or higher.
- Attendance at all events hosted by the NIST Center for Excellence in Statistics and Applications in Forensic Evidence (CSAFE) at Iowa State.
- Attendance at a national or regional scientific meeting devoted to forensic science.
- Completion of the certificate within three contiguous calendar years.

### Coursework

- 1 graduate credit seminar course in forensic science: **ANTHR 541**. This seminar will be offered each fall semester. In this seminar, you will report on the off-campus conference you attend, and also on your research.
- 1 graduate credit of independent study: **ANTHR 542**. You will choose a topic in forensics, ask the Director of Certificate Studies (DOCS) for approval, research it in the literature and write a paper on it. You will present this research project to the seminar group.
- At least 10 graduate credits from among the courses listed in the Certificate Electives course list. From this list, you may not choose any courses offered toward your academic major, and you must choose courses from at least two different departments entirely outside of your department or program. No credits may be transferred to ISU from other institutions.

All Certificate candidates are required to take ANTHR 541 (1 credit) and ANTHR 542 (1 credit). In addition, choose 10 credits from the following list of Certificate Electives:

AGRON 502	Chemistry, Physics, and Biology of Soils	3
AGRON 555	Environmental Soil Mineralogy	3
AN S 561	Population and Quantitative Genetics for Breeding	4
AGRON 563	Soil Formation and Landscape Relationships	3
ANTHR 503	Biological Anthropology and Archaeology	3
ANTHR 519	Skeletal Biology	3
ANTHR 524	Forensic Anthropology	3
B M S 554	General Pharmacology	3
CHEM 511	Advanced Analytical Chemistry	3
CHEM 513	Analytical Molecular and Atomic Spectroscopy	3
CHEM 516	Analytical Separations	3
CHEM 572	Spectrometric Identification of Organic Compounds	3
CHEM 577	Mass Spectrometry	3
CPR E 536	Computer and Network Forensics	3
ENT 675	Insecticide Toxicology	3
GEN 409	Molecular Genetics	3

GEN 462	Evolutionary Genetics	3
GDCB 511	Advanced Molecular Genetics	3
MATH 535	Steganography and Digital Image Forensics	3
M S E 550	Nondestructive Evaluation	4
M S E 551	Characterization Methods in Materials Science	3
M S E 552	Scanning and Auger Electron Microscopy	3
SOC 584	Current Issues in Crime and Justice	3
STAT 587	Statistical Methods for Research Workers	4
TOX 546	Clinical and Diagnostic Toxicology	1-3
V MPM 528	Principles of Epidemiology and Population Health	3
V MPM 586	Medical Bacteriology	4
V MPM 542	Introduction to Molecular Biology Techniques	1

## Genetics and Genomics

### GRADUATE MAJOR

Work is offered for the master of science and doctor of philosophy degrees with a major in Genetics and Genomics in fourteen cooperating departments: Agronomy; Animal Science; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Ecology, Evolution and Organismal Biology; Entomology; Food Science and Human Nutrition; Genetics, Development and Cell Biology; Horticulture; Materials Science and Engineering; Plant Pathology and Microbiology; Natural Resource Ecology and Management; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

Students are admitted by the approval of the Chair after review by the Genetics and Genomics Admissions Committee. Students are admitted either to participate in research rotations with several faculty before deciding on a major professor and laboratory, or by direct admission into a specific lab and department. First year students participating in rotations with Genetics and Genomics faculty will take GENET 697 Graduate Research Rotation.

The diversity of faculty in the Genetics and Genomics major ensures a broad, well-balanced education from the best instructors, while offering flexibility in choice of research area. Genetics and Genomics faculty have strengths in many areas, from fundamental studies at the molecular, cellular, organismal, and population levels, to research with immediate practical application. Ongoing research projects span all the major areas of theoretical and experimental genetics, including genomics, molecular studies of gene regulation, gene mapping, genetics of disease, transposable element studies, developmental genetics, quantitative and statistical genetics, computational molecular biology, evolutionary genetics, and population genetics.

## UNDERGRADUATE PREPARATION

Undergraduates wishing to prepare for graduate study in Genetics and Genomics should elect courses in basic biology, chemistry at least through organic chemistry, one year of college-level physics, mathematics at least through calculus, at least one thorough course in basic transmission and molecular genetics, one semester of upper level statistics and one semester of upper level biochemistry. Incoming students who have not completed an upper level statistics course and an upper level biochemistry course prior to beginning in the program will take STAT 587 Statistical Methods for Research Workers and BBMB 404 Biochemistry I during their first year of graduate training. A waiver may be requested for these courses by providing appropriate documentation (catalog description and syllabus) to the curriculum committee showing completion of an upper level statistics and upper level biochemistry course equivalent to STAT 587 Statistical Methods for Research Workers and BBMB 404 Biochemistry I.

See information from the College of Agriculture and Life Sciences or the College of Liberal Arts and Sciences for information on a bachelor of science degree in Genetics.

All Ph.D. candidates take a core curriculum comprising one course each from the following four categories and attend seminars and workshops as described:

#### Transmission Genetics

GDCB 510	Transmission Genetics
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#### Molecular Genetics

GDCB 511	Advanced Molecular Genetics
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#### Quantitative, Population, and Evolutionary Genetics

AN S 561 & AGRON 561	Population and Quantitative Genetics for Breeding and Population and Quantitative Genetics for Breeding
EEOB 507	Advanced Animal Behavior
EEOB 561	Evolutionary and Ecological Genomics
EEOB 563	Molecular Phylogenetics
EEOB 566	Molecular Evolution
EEOB 567	Empirical Population Genetics
GDCB 536	Statistical Genetics

#### Genomics, Bioinformatics and Statistical Genetics

AN S 556	Current Topics in Genome Analysis
BCB 544	Fundamentals of Bioinformatics
STAT 516	Statistical Design and Analysis of Gene Expression Experiments
STAT 581	Analysis of Gene Expression Data for the Biological Sciences
BCB 567	Bioinformatics Algorithms



BCB 568	Statistical Bioinformatics
BCB 569	Structural Bioinformatics
BCB 570	Systems Biology
EEOB 546	Computational Skills for Biological Data
COM S 551	Genomic Data Science

Students will give two research presentations (GENET 690 Graduate Student Seminar in Genetics), attend one genetics and genomics faculty seminar series (GENET 691 Faculty Seminar in Genetics), and participate in two Workshops in Genetics and Genomics (GENET 591 Workshop in Genetics) during their graduate training. First-year graduate students will take GENET 692 Conceptual Foundations of Genetics.

Students may elect a computational molecular biology specialty within the genetics major. This requires that the research project be in the field of computational molecular biology. IGG majors will be expected to complete all of the courses required for the genetics and genomics major, except that one semester of BCB 690 Student Seminar in Bioinformatics and Computational Biology can be substituted for GENET 690 Graduate Student Seminar in Genetics. Students will be expected to take additional courses in the area of specialization.

M.S. students will take the above core courses and seminars with the following changes: participate in one Workshop in Genetics (GENET 591 Workshop in Genetics) and present their research once (GENET 690 Graduate Student Seminar in Genetics). Additional coursework may be selected to satisfy individual interests or departmental requirements.

The course designator Genet applies to graduate courses taught by the interdepartmental major in Genetics and Genomics.

Students wishing to minor in genetics and genomics must submit a complete application to the graduate program. Requirements for the successful completion of a minor at the Ph.D. or M.S. levels are: completion of three of the four categories of the common-core required lecture courses listed above. One semester of Seminar in Genetics is recommended.

GENET 690	Graduate Student Seminar in Genetics	1
GENET 691	Faculty Seminar in Genetics	1
GENET 692	Conceptual Foundations of Genetics	1

One member of the POS committee must be a Genetics faculty member.

**Student Outcomes:** Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U.S. or abroad in preparation for research and/or teaching positions in academia, industry, or government. A few go directly to permanent research positions in industry. Many students awarded master's degrees continue their training as doctoral students; however, some choose

research support positions in academia, industry, or government. A more thorough list of outcomes is available at our web site.

#### **Courses primarily for graduate students, open to qualified undergraduates:**

##### **GENET 539: Ethics and Biological Sciences**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

Introduction to Bioethics through case studies, discussion of contemporary work on central bioethics topics, and discussion of important emerging ethical issues associated with recent research or technological development. Issues covered will vary somewhat from year to year, but will include at least some of the following: ethics and responsible research practice, animal ethics and the use of animals in teaching and research, cloning, human reproductive and stem cell research, regulation of genetically modified crops and foods, plant biotechnology, gene patents. Students will be divided into groups to develop their own case study, to be presented in class at the end of the term. Offered on a satisfactory-fail basis only.

##### **GENET 590: Special Topics**

Cr. arr. Repeatable. F.S.SS.

Contact individual faculty for special projects or topics. Graded.

##### **GENET 591: Workshop in Genetics**

(1-0) Cr. 1. Repeatable. F.

*Prereq: Permission of instructor*

Current topics in genetics research. Lectures by off-campus experts. Students read background literature, attend preparatory seminars, attend all lectures, meet with lecturers.

#### **Courses for graduate students:**

##### **GENET 690: Graduate Student Seminar in Genetics**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor*

Research presentations by students to improve their ability to: orally present scientific work in a clear and meaningful way, critically evaluate oral presentations, and give and receive constructive criticism. Students may enroll in one seminar per school year.

##### **GENET 691: Faculty Seminar in Genetics**

(1-0) Cr. 1. Repeatable. F.

*Prereq: Permission of instructor*

Faculty research seminars that introduce students to the variety of genetics research projects on campus and provide an opportunity for students to become engaged in the scientific presentation to the point where they can think critically and ask meaningful questions.



**GENET 692: Conceptual Foundations of Genetics**

(1-0) Cr. 1. F.

*Prereq: Permission of instructor*

Landmark papers in the development of genetics concepts. Papers are presented and discussions led by students, guided and mentored by the instructors. Instructors provide a broad overview and history of the development of fundamental concepts in genetics.

**GENET 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with AGRON, BCB, E E, ENGR, M E). (3-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq: Graduate student status and completion of at least one semester of graduate coursework.*

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**GENET 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.SS.

Graduate research projects performed under the supervision of selected faculty members in the graduate Genetics major. Offered on a satisfactory-fail basis only.

**GENET 699: Research**

Cr. arr. Repeatable. F.S.SS.

Research.

## Honors Program

## Honors Program

The University Honors Program brings together some of Iowa State University's brightest and most motivated students to take advantage of both intellectual and social opportunities. Honors scholars gain early exposure to research and leadership as well as benefit from creating an individualized educational path adding breadth and depth to their academic experience.

Students in the First-Year Honors Program (<https://www.honors.iastate.edu/program/fhp/>) typically enroll in five Honors credits in their first term (Engl 250H, Lib 160, Honors 121) and may opt to participate in the First-Year Mentor Program (<https://www.honors.iastate.edu/program/fhp/first-year-mentor-program/>), a two-credit research experience during their second term. In the

University Honors Program, students receive a variety of academic opportunities to help them optimize their undergraduate experience. They create individualized programs of study with opportunities to incorporate independent study and research. Grants (<https://www.honors.iastate.edu/scholarships/research-grants/>) are available to support Honors student research. Students who complete their work in the University Honors Program receive a notation on their transcript.

All Honors students take at least two Honors courses and two Honors seminars (listed as HON 321-324), complete an independent research or creative project (<https://www.honors.iastate.edu/program/uhp/project/>), and maintain an overall GPA of 3.5 or higher. Most Honors requirements also fulfill requirements for graduation. Depending on the college of their primary major, students may need to fulfill additional requirements (<https://www.honors.iastate.edu/program/uhp/college-reqs/>).

Honors credit for a course (<https://www.honors.iastate.edu/program/uhp/courses/>) is denoted by an "H" on the transcript and can be earned in the following ways: enrollment in an Honors section of a class, contracting an Honors Component within a class, enrollment in a 500-level graduate course.

Honors seminars (<https://www.honors.iastate.edu/program/uhp/seminars/>) are one- or two-credit special topic classes offered only to Honors students. With enrollment generally limited to 17 students, these seminars promote a crucial atmosphere of intellectual exchange and a high level of student involvement in learning.

Oversight of Honors students' progress is carried out by the Honors Program staff in coordination with the undergraduate colleges. Each college's Honors committee approves its students' programs of study and project proposals. The University Honors Program Committee is responsible for the program's curricular oversight. The Honors Program Office is located at 2130 Jischke Honors Building. For additional information, visit [www.honors.iastate.edu](http://www.honors.iastate.edu) (<https://www.honors.iastate.edu/>) or contact [honors@iastate.edu](mailto:honors@iastate.edu).

## HONORS PROGRAM

The Iowa State University Honors Program is designed for students who have demonstrated the ability and motivation to assume more than the usual responsibility for their undergraduate education. The program enables honors students to gain the maximum benefit from their undergraduate education. Students who graduate in the Honors Program receive the honors designation on their transcripts and diplomas.

Special educational opportunities. Students in the Honors Program determine their educational objectives and devise an individualized program of study to meet them. An honors program may include substitutions for required courses, a combination of courses from several

departments to form a new major or minor, Honors courses or seminars, independent study and research, and other forms of innovation.

Other benefits. Members of the Honors Program have 24-hour access to the Jischke Honors Building as a quiet place to study and visit with other honors students. Students also have off-campus opportunities such as attending honors semesters and conferences. Members receive extended loan privileges at the Library, priority scheduling, and the opportunity to apply for research funds.

ISU students who have a cumulative grade-point average of at least 3.5 become eligible to apply for admission to the Honors Program during their second semester in residence and continue to be eligible as long as they have at least 48 semester credits remaining before graduation. Transfer students with a G.P.A. of 3.5 or higher and more than 60 credits remaining are also eligible to apply.

## FIRST-YEAR HONORS PROGRAM

Entering first-year students with outstanding high school records and academic ability may be eligible to participate in the First-Year Honors Program (FHP). The FHP, which introduces students to an honors education, consists of honors sections of English 250 and Library 160, an FHP seminar, and honors advisors. Students may also choose to participate in the Honors Mentor Program, which introduces students to scholarship and research. Participants are matched with faculty members conducting research in an areas of mutual interest. Admission to the FHP is limited, and is based on past academic achievement, potential, and interest in an honors education.

Further information concerning the University Honors Program and the First-Year Honors Program can be obtained from the Honors Program Office, 2130 Jischke Honors Building or [www.honors.iastate.edu](http://www.honors.iastate.edu) (<http://www.honors.iastate.edu>).

### HON 121: First-Year Honors Program Seminar

(0-2) Cr. 1. F.

*Prereq: Membership in the First-Year Honors Program*

Orientation to Iowa State University and to the University Honors Program. Students will meet and work with other high-ability students for the purpose of exchanging ideas and considering alternative futures as a basis for launching personalized academic programs and professional careers. Offered on a satisfactory-fail basis only.

### HON 290: Special Problems

Cr. arr.

*Prereq: Membership in the First-Year Honors Program*

Independent study on topics of an interdisciplinary nature. Intended primarily for freshmen and sophomores. Offered on a satisfactory-fail basis only.

### HON 290H: First-Year Honors Mentor Program

Cr. 1-2. F.S.

*Prereq: Membership in the First-Year Honors Program*

Independent research study as a part of the First-Year Honors Mentor program (FHMP), which offers first-year honors students the opportunity to get research experiences with a faculty mentor. The main objectives of the FHMP are to develop students' interest in and understanding of academic research and to help them identify a research area for an honors capstone project. Offered on a satisfactory-fail basis only.

### HON 290U: Undergraduate Research

Cr. arr. F.S.

*Prereq: Membership in the University Honors Program; Permission of the University Honors Program Director*

Independent study as a continuation of the First-Year Honors Mentor program (FHMP), which offers second-year honors students the opportunity to continue research experiences with the same FHMP faculty mentor as in the HON 290H course. The main objectives are to extend students' involvement in research and understanding of an academic field and to help them identify a research area for an honors capstone project. Offered on a satisfactory-fail basis only.

### HON 302: First-Year Honors Leadership Development

(1-2) Cr. 2. F.

*Prereq: Permission of the Director for First-Year Honors Program*

For students serving as leaders of First-Year Honors Seminars, under faculty supervision. Development of teaching and leadership skills to augment the experiential education students are gaining by co-instructing Honors 121. Offered on a satisfactory-fail basis only.

### HON 321: University Honors Seminars

Cr. 1-2. F.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

### HON 322: University Honors Seminars

Cr. 1-2. S.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

### HON 323: University Honors Seminars

Cr. 1-2. F.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 324: University Honors Seminars**

Cr. 1-2. S.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 490: Independent Study**

Cr. arr. Repeatable. F.S.

*Prereq: Membership in the University Honors Program; Permission of the University Honors Program Director*

Independent study on topics of an interdisciplinary nature. Intended primarily for juniors and seniors.

## Human Computer Interaction Interdepartmental Graduate Program

Human Computer Interaction is an interdepartmental graduate program that seeks to improve the way individuals and groups use computers through an understanding of the social and cognitive aspects of the design and use of computational devices. Students in the program learn about cognitive psychology, graphic design principles, the impacts of technology on society, evaluating system usability, and cutting edge computer programming for computational perception and language parsing.

Student research projects have explored the latest in virtual reality studies, improving natural interaction through touch screens and 3D camera gesture controls, virtual engineering using force feedback devices, and many other projects at the bleeding edge of technological innovation. Graduates of the program have gone to work at many of the largest technology firms in the US and abroad while others have gone on to positions in academia.

Degrees are offered for the Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees with a major in Human Computer Interaction (HCI). A Graduate Certificate and an Online Master of Human Computer Interaction (M.HCI) degree are also offered; these degrees are especially targeted for the benefit of students working in business and industry wanting education in this field. The graduate program in Human Computer Interaction (HCI) welcomes applicants from a diverse collection of technical and creative fields whose unifying characteristic is the desire to develop new ways to bridge the gap between human and machine. The students must demonstrate skill in software development and proficiency in high-level, object-oriented programming. These skills can be acquired after admission to the program. Other entrance requirements will include an undergraduate degree and transcripts, test scores and other indicators that the applicant can be successful at the graduate level. All students admitted to the PhD program on campus must secure a graduate assistantship.

Program requirements can be found on the program's webpage (<http://www.vrac.iastate.edu/hci/>) and in the Human Computer Interaction Graduate Student Handbook.

All programs of study for the Ph.D. must include:

1. one core course of their choice from each of the categories of Implementation, Design, Evaluation and Phenomena, if not completed as part of the student's master's program
2. two more courses of their choice from a list of recommended electives
3. a minimum of nine research credits.

The M.S. degree calls for 30 credits of course work including appropriate credit for the master's thesis. M.S. students must take one core course of their choice from each of the categories of Implementation, Design, Evaluation and Phenomena. In addition to these courses, M.S. students will be required to take a minimum of 3 research credits.

The online M.HCI program is most appropriate for individuals with a bachelor's degree in a scientific, engineering, business, or artistic discipline, who are pursuing a professional career, and who already have a strong base of information technology skills. Requirements for the online M.HCI Program include taking four courses, one each from the Design, Implementation, Phenomena and Evaluation categories. However, M.HCI students must take two additional courses of their choice from the list of core courses or the list of recommended electives. M.HCI students will therefore be required to take a total of six courses (18 credits) and the remaining four courses (12 credits) would be electives of your choosing.

Requirements for the HCI Graduate Certificate program include three core HCI courses plus one elective.

Information on applications procedures and specific requirements of the major can be obtained on the program webpage: <http://www.vrac.iastate.edu/hci/>

## Immunobiology Immunobiology Interdepartmental Graduate Program

Work is offered for the master of science and doctor of philosophy degrees with a major in Immunobiology. Faculty are drawn from twelve university departments along with researchers from the National Animal Disease Center. Participating departments include: Animal Science; Biochemistry, Biophysics, and Molecular Biology; Biomedical Sciences; Chemical & Biological Engineering; Entomology; Food Science and Human Nutrition; Kinesiology; Natural Resource Ecology & Management; Veterinary Clinical Sciences; Veterinary Diagnostic & Production Animal Medicine; Veterinary Microbiology & Preventative Medicine; and Veterinary Pathology. The diversity of faculty expertise ensures a broad

education while offering flexibility in choice of specialization. Ongoing research projects include areas such as: antibody and cell-mediated immunity, gene expression, immunochemistry, immunogenetics, immunomodulation, immunophysiology, mucosal immunity and nutritional immunology. Additional information about program faculty members is available at: [www.immunobiology.iastate.edu](http://www.immunobiology.iastate.edu) (<http://www.immunobiology.iastate.edu/>).

Students may enter the Immunobiology program in one of two ways; prospective students may apply directly to the major, or current ISU graduate students may be admitted as a co-major or minor in Immunobiology. Ph.D. students admitted into the Interdepartmental Immunobiology major will take IMBIO 697 Graduate Research Rotation during their first two semesters. From these rotations the student will select a major professor and join a home department. Affiliating with a major professor is done by the end of the second semester.

Before entering the Immunobiology program, prospective students should have a strong background in the biological sciences; typically including work in immunology, genetics and biochemistry. Prior research experience is highly encouraged.

Immunobiology students should include in their program of study a core of courses which will provide a broad coverage of the basic program in immunobiology. Formal courses should include immunology, biochemistry, and statistics. Additional coursework may be selected to satisfy individual interests or departmental requirements.

Graduates of the Immunobiology program will have a broad understanding of the interdisciplinary field of immunobiology and will be able to effectively integrate the principles of immunology with related disciplines. They are able to effectively communicate with scientific colleagues and the general public in both formal and informal settings. Graduates are able to integrate theory and research to address complex problems facing scientific professionals studying animal and human health, taking into account related ethical, social, legal and environmental issues. They are skilled at carrying out research, communicating research results, and writing persuasive grant proposals.

## GRADUATE STUDY IN IMMUNOBIOLOGY

### Curriculum Requirements for Immunobiology Doctoral Students

Ph.D. candidates majoring in Immunobiology must take at least 72 graduate credits. This 72 credits includes the below core course requirements and applicable research credits earned. Credits taken during a student's M.S. program in Immunobiology at Iowa State University will count towards their Ph.D. in Immunobiology.

### Ph.D. students should take each of the following:

BBMB 405	Biochemistry II	3
IMBIO 602	Current Topics Workshop in Immunology Repeated each Fall	1
IMBIO 604	Seminar in Immunobiology Repeated each Spring	1
IMBIO 699	Research	arr†
STAT 587	Statistical Methods for Research Workers	4
V MPM 615	Molecular Immunology	3
GR ST 565	Responsible Conduct of Research in Science and Engineering	1

† Arranged with instructor.

### Take one of the following two:

V MPM 520	Principles of Immunology	3
V MPM 575	Immunology	3

### Take at least two courses from the following approved electives:

BBMB 545	Molecular Signaling	2
IMBIO 661	Comparative Immunology and Infectious Disease	2
GDCB 528	Advances in Molecular Cell Biology	3
V MPM 540	Livestock Immunogenetics	2
V MPM 608	Molecular Virology	3
V MPM 625	Mechanisms of Bacterial Pathogenesis	3
V MPM 629	Advanced Topics in Cellular Immunology	2
V PTH 661	Comparative Immunology and Infectious Disease	2

## Curriculum Requirements for Immunobiology Master's Students

All M.S. students majoring in Immunobiology are required to complete a minimum of 30 graduate credits. These 30 credits includes core course requirements and applicable research credits earned. The requirements for M.S. students are the same as that for Ph.D. students with the exception of the elective credits. M.S. students are required to take **at least one course from the list of electives** as opposed to the two course minimum for Ph.D. students.

## Curriculum Requirements for a Minor in Immunobiology at the PhD Level

Graduate students studying at Iowa State University with an interest in completing an Immunobiology minor for their Ph.D. studies are required to take a total of 12 credit hours of coursework including core courses and approved electives.

Students must be approved for the minor by the Immunobiology program and must follow Graduate College guidelines for POS Committee membership.

Graduate students wishing to seek a minor in Immunobiology are encouraged to contact the Immunobiology Interdepartmental Graduate Program Coordinator for further information. Inquiries can be submitted to: [idgp@iastate.edu](mailto:idgp@iastate.edu).

## Immunobiology Minor Curriculum at the Ph.D. Level Includes:

One course from each of the following two categories:

### Category A:

V MPM 520	Principles of Immunology	3
V MPM 575	Immunology	3

### Category B:

V MPM 615	Molecular Immunology	3
V MPM 629	Advanced Topics in Cellular Immunology	2

### One enrollment in the following:

IMBIO 602	Current Topics Workshop in Immunology	1
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### Minimum of 2 courses from any of the following approved electives:

BBMB 545	Molecular Signaling	2
GDCB 528	Advances in Molecular Cell Biology	3
IMBIO 661	Comparative Immunology and Infectious Disease	2
MICRO 408	Virology	3
MICRO 554	Virology	1
V MPM 540	Livestock Immunogenetics	2
V MPM 608	Molecular Virology	3
V MPM 625	Mechanisms of Bacterial Pathogenesis	3
V MPM 629	Advanced Topics in Cellular Immunology	2
V PTH 661	Comparative Immunology and Infectious Disease	2

## Interdisciplinary Graduate Studies

[www.grad-college.iastate.edu/igs/](http://www.grad-college.iastate.edu/igs/) (<http://www.grad-college.iastate.edu/igs/>)

## GRADUATE PROGRAM

The degree Master of Science or Master of Arts with a major in Interdisciplinary Graduate Studies (IGS) is available to graduate students who wish to have a more diversified program of advanced study than generally permitted for students who specialize in a single subject. The program is open to any qualified graduate student but is most useful to those who wish to improve their subject matter competence in more than one discipline.

Those who elect to pursue the Interdisciplinary Graduate Studies Program are allowed to take courses in three different graduate subject matter areas, each subject contributing a **minimum** of nine (9) semester credits toward the 35 graduate credits required for the degree. Courses

which may be used for credit toward this degree are selected from those listed in the *Iowa State University Catalog*.

Both thesis and non-thesis options are available. In the thesis option, the student, with the guidance of a major professor, develops and reports in writing a research study. In the non-thesis option, a creative component is required in which the student demonstrates independent creativity such as a written report of laboratory, field, or library research, a project in fine arts, or some other original contribution. A minimum of three (3) and maximum of five (5) credits in either IGS 599 Creative Component or IGS 699 Thesis Research may be counted toward the total 35 semester credits.

The student, in consultation with their Program of Study Committee, will decide on the choice of option (i.e., thesis or non-thesis). The Program of Study Committee also aids the student in planning and approving a program of study and selecting appropriate courses.

A student majoring in Interdisciplinary Graduate Studies may participate in any one of the following areas of specialization:

- Arts and Humanities (<http://igs.grad-college.iastate.edu/areas-of-specialization/arts-and-humanities/>)
- Biological and Physical Sciences (<http://igs.grad-college.iastate.edu/areas-of-specialization/biological-and-physical-sciences/>)
- International Development Studies (<http://igs.grad-college.iastate.edu/areas-of-specialization/international-development-studies/>)
- Social Sciences (<http://igs.grad-college.iastate.edu/areas-of-specialization/social-sciences/>)

Because of the interdisciplinary nature of the Interdisciplinary Graduate Studies Program, students are expected to demonstrate that they can relate in a significant way at least two of the three chosen areas of study. This is usually done in the written work for the thesis research or creative component. In their final oral examination, students also are expected to be able to discuss the relationship among the three areas of study.

### Courses primarily for graduate students, open to qualified undergraduates:

#### IGS 520: Orientation in Community Development

(1-0) Cr. 1.

Introduction to the Community Development program. Focus on on-line delivery methods, graduate level research and writing, technology skills.

#### IGS 599: Creative Component

Cr. arr. Repeatable.

### Courses for graduate students:



**IGS 699: Thesis Research**

Cr. arr. Repeatable.

## Interdisciplinary Studies

### INTERDISCIPLINARY STUDIES UNDERGRADUATE MAJOR

#### Administered by the College of Liberal Arts and Sciences

A major in interdisciplinary studies is offered in the College of Liberal Arts and Sciences for undergraduate students who have unique interdisciplinary educational goals. The student, a faculty review board, and an academic advisor design the major. Leading to either the Bachelor of Arts or the Bachelor of Science degree, the major includes 36 to 48 credits of coursework chosen to provide a coherent, carefully planned program in an area of interest that bridges two or more disciplines. This specialized area is identified on the diploma. Learning goals are individually crafted for each proposed major. All interdisciplinary studies majors must also satisfy the requirements of the liberal arts and sciences curriculum in the College of Liberal Arts and Sciences.

A degree in Interdisciplinary Studies may be particularly attractive to students who wish to develop an area of interest based upon one of the College's cross-disciplinary programs; the faculty of the cross-disciplinary studies programs in Classical Studies and U.S. Latino/a Studies have laid out an interdisciplinary track for study in those areas.

Students have also worked with faculty to propose Interdisciplinary Studies tracks in areas of interest such as International Relations, Ecology Studies, African American Cultural Studies, Asian Studies, and Cognitive Studies. Currently students are working with faculty to identify interdisciplinary programs of study in Climate Science and Health Science.

#### Learning Outcomes

As part of the proposal process students are expected to identify specific learning goals of their proposed interdisciplinary coursework. In addition to meeting the learning goals of the general education program of the College of Liberal Arts and Sciences and meeting university-wide learning goals, Interdisciplinary Studies majors graduates will be able to:

- Integrate knowledge and modes of thinking grounded in interdisciplinary inquiry
- Use methods and tools from multiple disciplines to solve problems
- Connect their learning to their professional goals

Further information about the Interdisciplinary Studies major can be obtained from the LAS College Student Academic Services office.

## HOW TO PROPOSE AN INTERDISCIPLINARY PROGRAM

A student seeking admission to the program in interdisciplinary studies develops a proposal in consultation with faculty and an advisor. The proposal will include a program of study and a letter of application that explains how the proposed major meets specific educational and learning goals. Since students are expected to earn at least 30 credits after they are admitted into the program, the proposal is ordinarily submitted to the LAS Associate Dean for Academic Programs during the sophomore or junior year. The proposal will be considered if the area of interest properly falls within the College of Liberal Arts and Sciences and if the student's educational goals cannot be met by a more traditional combination of existing majors, minors, and electives.

#### Specific Requirements for the Program of Study

The interdisciplinary studies major must meet College of Liberal Arts and Sciences and University-wide requirements for graduation. In addition the proposed major must include 36 to 48 credits of coursework chosen to lead to a distinctive set of learning outcomes and bridge two or more disciplines. A major emphasizing the humanities or communicative arts normally leads to a B.A.; a major emphasizing the natural or social sciences normally leads to a B.S. Different requirements for the B.A. and B.S. degrees are determined by the nature of the chosen field of study. Courses listed in the individualized major may come from any department of the university with the following restrictions:

1. The selection of courses needs to focus on a single theme and be consistent with the career and educational goals of the student.
2. At least one half of the courses in the major will come from departments within the College of Liberal Arts and Sciences.
3. The courses will be chosen from at least two disciplines.
4. All courses in the major must be at the 200-level or higher.
5. At least 15 credits must be at the 300-level or higher with at least 6 credits at the 400-level or higher.

An average grade of C or better must be earned in 15 credits at the 300-level or higher in the major.

To meet the English and communication proficiency requirement, a grade of C or better must be earned in ENGL 250 and in either an advanced English composition course or a course in the major with a significant writing component.

LAS majors require a minimum of 120 credits, including a minimum of 45 credits at the 300/400 level. You must also complete the LAS world language requirement and career proficiency requirement.

Students in all ISU majors must complete a three-credit course in U.S. diversity and a three-credit course in international perspectives. Check (<http://www.registrar.iastate.edu/courses/div-ip-guide.html>) for a list of



approved courses. Discuss with your advisor how the two courses that you select can be applied to your graduation plan.

Forms and sample proposals are available here (<https://iastate.box.com/s/mf3126yjf7tobnjoq9lf4jw67jmxm8iv/>). Further information may be obtained from the LAS College Student Academic Services office.

## INTERDISCIPLINARY STUDIES MAJOR WITH A TRACK IN CLASSICAL STUDIES

Students may pursue an Interdisciplinary Studies Major with a track in Classical Studies by completing a program of study defined by faculty who work in this interdisciplinary program. Additional information is available on the Classical Studies page of the catalog.

## INTERDISCIPLINARY STUDIES MAJOR WITH A TRACK IN U.S. LATINO/A STUDIES

Students may pursue an Interdisciplinary Studies Major with a track in U.S. Latino/a Studies (<http://catalog.iastate.eduhttps://collegeofliberalartsandsciences/uslatino-a-studies/#interdisciplinarymajortext>) by completing a program of study defined by faculty who work in this cross-disciplinary program. Additional information is available on the U.S. Latino/a Studies page of the catalog.

## Iowa Lakeside Laboratory INTERINSTITUTIONAL PROGRAM

Iowa Lakeside Laboratory is run cooperatively by the Iowa Lakeside Laboratory Consortium whose members include Drake University, Iowa State University, the University of Northern Iowa, and the University of Iowa. Lakeside courses can be taken for credit through all Consortium members. Students should check with their advisors to determine whether Lakeside courses can be used to satisfy major or minor requirements or college or university general education requirements.

The Laboratory was established in 1909 for the conservation and study of the rich flora and fauna of northwest Iowa, especially those of the Iowa Great Lakes region with its numerous lakes, wetlands, and prairies. Its campus is located on approximately 140 acres of restored prairie, wetland, and gallery forest along the west shore of West Okoboji Lake. Lakeside's mission is to provide undergraduate and graduate students an opportunity to get hands-on experience working with a variety of natural and human environments through its field-oriented summer courses and to provide research facilities and support for graduate students and faculty working on research projects in northwestern Iowa. Each summer, Iowa Lakeside Laboratory offers students a unique educational experience: small, full-immersion, field-oriented courses in the natural sciences (archaeology, ecology, environmental science, hydrology, evolution, geology, soils, taxonomy). All courses meet all day

from Monday through Friday. The majority of courses run for 4 weeks. Enrollments in most courses are limited to 8 to 10 students.

Courses are taught at the undergraduate (sophomore and junior) and the senior/graduate level. Students obtain one credit for each week (40 hours) in class. One and two week courses are also available, including courses designed especially for teachers. Weather permitting, students normally spend at least part of each day doing field work, either as part of their class work or working on individual or group projects. Because some courses are offered intermittently, the current Iowa Lakeside Laboratory summer brochure or the Lakeside Lab Website ([www.lakesidelab.org](http://www.lakesidelab.org)) should be consulted for the list of courses being offered in a given summer session. The Lakeside Lab Website ([www.lakesidelab.org](http://www.lakesidelab.org)) also contains additional information about the Laboratory and about each course being offered.

Research projects by undergraduates, graduate students and faculty can be done either on the campus or at many nearby natural areas. Undergraduate and graduate students are strongly encouraged to do independent projects at Lakeside and graduate students are welcome to use it as a base for their thesis and dissertation research. Laboratory space and other facilities are available for long-term or short-term research projects.

Teaching and research facilities include eight laboratory buildings, a library, and a lecture hall. Living accommodations include cottages, motel-style units, and a large mess hall. All students are encouraged to stay at Lakeside while they are taking courses to take full advantage of its educational, professional, and social life.

### Financial Aid

Iowa Lakeside Laboratory Scholarships are available to both undergraduates and graduate students. All scholarships cover room and board. Information about how to apply for Iowa Lakeside Laboratory Scholarships is included on the Website ([www.lakesidelab.org](http://www.lakesidelab.org)). Students should also consult the Student Financial Aid Office for other scholarship, work study, and loan programs for which they are eligible.

### Registration

Students can only enroll in Iowa Lakeside Lab courses by submitting an Iowa Lakeside Lab Registration and Scholarship form and Housing form to the Iowa Lakeside Laboratory Administrative Office. These forms are found on the Iowa Lakeside Laboratory Website ([www.lakesidelab.org](http://www.lakesidelab.org)).

Early registration is advisable. Because enrollment in Lakeside courses is limited, students should register before May 1 for the following summer

session. Housing is also limited and students must apply for housing or indicate that they plan to live off campus at the time of registration.

### IOWA LAKESIDE LABORATORY

Iowa Lakeside Laboratory is an off-campus teaching and research facility situated on a 140-acre campus on West Okoboji Lake in Northwest Iowa. It is run cooperatively by Iowa State University, the University of Iowa, the University of Northern Iowa, and Drake University. Each summer Iowa State University students can take up to three undergraduate and/or graduate courses in archaeology, biology, ecology, environmental science, and/or geology for credit at Lakeside (see course listings under Iowa Lakeside Laboratory). All Lakeside courses are small, full-immersion, field-oriented courses that run for 1-4 weeks. Lakeside also offers a variety of short courses for teachers and a series of nontechnical short courses on various aspects of the natural history of Iowa. Information about Lakeside courses as well as registration and housing information can be obtained from the Biology Program Office, 103 Bessey Hall or on the Lakeside Web site, <https://iowalakesidelab.org/>.

## Molecular, Cellular, and Developmental Biology

### MCDB Interdepartmental Graduate Program

Work is offered for the doctor of philosophy degree with a major in Molecular, Cellular, and Developmental Biology. Faculty are drawn from sixteen university departments along with researchers from the National Animal Disease Center. Participating departments include: Agronomy; Animal Science; Biochemistry, Biophysics & Molecular Biology; Biomedical Sciences; Chemistry; Chemical & Biological Engineering; Ecology, Evolution, & Organismal Biology; Entomology; Food Science & Human Nutrition; Genetics, Development & Cell Biology; Horticulture; Kinesiology; Physics & Astronomy; Plant Pathology; Veterinary Microbiology & Preventive Medicine; and Veterinary Pathology. Facilities and qualified faculty are available in these departments for conducting fundamental research in the various aspects of molecular, cellular, and developmental biology. Ongoing research projects include molecular and cellular studies of viral, prokaryotic, fungal, plant, and animal systems. Additional information about the program and faculty is available at: [www.mcdb.iastate.edu](http://www.mcdb.iastate.edu) (<http://www.mcdb.iastate.edu/>).

Prospective students are admitted by the MCDB program following receipt of a complete application and after review by the MCDB Admissions Committee. Students are admitted either to participate in research rotations with several faculty before deciding on a major professor and laboratory, or by direct admission into a specific lab and department. Ph.D. students typically enter via rotation and are required to complete a minimum of three research lab rotations with faculty of interest and take MCDB 697 Graduate Research Rotation during their

first two semesters. At the end of their second semester, students on rotation must select a major professor from the faculty participating in the program. Current ISU graduate students may be admitted as a co-major or minor with MCDB.

Before entering the MCDB program, prospective students should have a strong background in the biological sciences; typically including work in biological sciences (two years), organic chemistry (one year), physics (one year), and mathematics (through one year of calculus). Prior research experience is highly encouraged.

## UNDERGRADUATE STUDY

A special program in Molecular, Cellular, and Developmental Biology is not offered for the baccalaureate. Undergraduates wishing to prepare for graduate study in molecular, cellular, and developmental biology should elect courses in biochemistry, biology, genetics, microbiology; and mathematics through calculus; chemistry through organic; and one year of physics.

The following are recommended to undergraduates desiring an introduction to this area:

BIOL 313	Principles of Genetics	3
BIOL 313L	Genetics Laboratory	1
BIOL 314	Principles of Molecular Cell Biology	3
BIOL 423	Developmental Biology	3
BIOL 423L	Developmental Biology Laboratory	1
BIOL 428	Cell Biology	3

## CURRICULUM REQUIREMENTS FOR MCDB

Ph.D. candidates majoring in MCDB must take at least 72 graduate credits. These 72 credits include the core course requirements (below) and applicable research credits earned.

Additional coursework may be selected by the student in consultation with their Program of Study (POS) Committee to meet departmental requirements and to satisfactorily prepare the student for their research project.

Graduate credits of B or better earned in another Iowa State program, or at another institution, may be transferred at the discretion of the POS Committee and with the approval of the MCDB Program and the ISU Graduate College.

Additional information relating to credits required for graduate degrees can be found in the ISU Graduate College Handbook (<http://www.grad-college.iastate.edu/common/handbook/>).

**MCDB Core Curriculum requirements include:**

BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
Students with a Biochemistry background can elect to take the 500-level sequence (two of the following courses):		
BBMB 504	Amino Acids and Proteins	2
BBMB 505	Bioenergetics and Metabolism	2
BBMB 506	Membrane Biochemistry	2
BBMB 507	Biochemistry of Nucleic Acids	2

**All Ph.D. students must take one course from each of the following areas: A) Cellular Biology, B) Developmental Biology, & C) Molecular Biology.**

**A. Cellular Biology**

GDCB 528	Advances in Molecular Cell Biology	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3
B M S 575	Cell Biology	3
BBMB 545	Molecular Signaling	2

**B. Developmental Biology**

GDCB 533	Advances in Developmental Biology	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3

**C. Molecular Biology**

MICRO 502	Microbial Genetics and Genomics	3
GDCB 511	Advanced Molecular Genetics	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3
V MPM 608	Molecular Virology	3

\*Footnote: GDCB 545 - Plant Molecular, Cellular, and Developmental Biology may be used to fulfill any one of the required component areas.

**In addition to the above course requirements, MCDB graduate students are required to take:**

**1. Two semesters of research seminar every year.**

Fall semester students will enroll in 1) a "for credit" research seminar series offered by the student's home department, 2) a workshop comprised of a research seminar series, or 3) another ISU research seminar series, typically chosen from one of the following departments: Agronomy, Animal Science; Biochemistry, Biophysics & Molecular Biology; Biomedical Sciences; Chemistry; Chemical & Biological Engineering; Ecology, Evolution, & Organismal Biology; Entomology; Food Science & Human Nutrition; Genetics, Development & Cell Biology; Horticulture; Kinesiology; Physics & Astronomy; Plant Pathology; Veterinary Microbiology & Preventive

Medicine; and Veterinary Pathology. (Options 2 and 3 are subject to approval by the POS committee).

Spring semester register for MCDB 698, Seminar in Molecular, Cellular, and Developmental Biology. In seminar, students will make journal and research presentations and attend MCDB seminars. Three semesters of MCDB 698 are required. Beyond this requirement, students must enroll in additional semesters of MCDB 698 or enroll in seminar series as described above for fall semesters.

**2. One credit hour of ethics training.**

GR ST 565	Responsible Conduct of Research in Science and Engineering	1
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**Not required, but highly recommended for MCDB graduate students:**

BCB 544	Fundamentals of Bioinformatics	4
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Non-native English speakers must pass the English Requirement as established by the university. Depending on the results of this exam additional courses may be required to meet English proficiency standards.

MCDB graduate students need to teach one semester as part of their training for an advanced degree. Students whose first language is not English must take and pass the Oral English Certification Test (OECT) to be eligible to teach.

**Curriculum Requirements for Graduate Students Seeking a MCDB Minor**

Graduate students studying at Iowa State University with an interest in completing a MCDB minor for their Ph.D. are required to complete the following curriculum requirements.

Students must be approved for the minor by the MCDB program and must follow Graduate College guidelines for POS Committee membership.

Graduate students wishing to seek a minor in MCDB are encouraged to contact the MCDB Interdepartmental Graduate Program Coordinator for further information. Inquiries can be submitted to idgpp@iastate.edu.

**MCDB Minor Curriculum at the Ph.D. Level Includes:**

BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
Students with a Biochemistry background can elect to take the 500-level sequence (two of the following courses):		
BBMB 504	Amino Acids and Proteins	2
BBMB 505	Bioenergetics and Metabolism	2

BBMB 506	Membrane Biochemistry	2
BBMB 507	Biochemistry of Nucleic Acids	2

**One course in each of two of the following three areas: A) Cellular Biology, B) Developmental Biology, & C) Molecular Biology.**

**A. Cellular Biology**

GDCB 528	Advances in Molecular Cell Biology	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3
B M S 575	Cell Biology	3
BBMB 545	Molecular Signaling	2

**B. Developmental Biology**

GDCB 533	Advances in Developmental Biology	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3

**C. Molecular Biology**

MICRO 502	Microbial Genetics and Genomics	3
GDCB 511	Advanced Molecular Genetics	3
GDCB 545	Plant Molecular, Cell and Developmental Biology *See footnote	3
V MPM 608	Molecular Virology	3

**\*Footnote: GDCB 545 - Plant Molecular, Cellular, and Developmental Biology may be used to fulfill any one of the required component areas.**

**In addition to the above course requirements, MCDB graduate minors are required to register once for:**

MCDB 698	Seminar in Molecular, Cellular, and Developmental Biology	1-2
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**Courses primarily for graduate students, open to qualified undergraduates:**

**MCDB 511: Advanced Molecular Genetics**

(Cross-listed with GDCB). (3-0) Cr. 3. S.

*Prereq: BIOL 313 and BBMB 405*

Mechanisms of molecular genetic processes in eukaryotes and prokaryotes, including DNA replication and repair, transcription, translation and regulation of gene expression. Critical evaluation and discussion of current primary literature, methodologies and experimental data.

**MCDB 528: Advances in Molecular Cell Biology**

(Cross-listed with GDCB). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Courses in general cell biology and biochemistry*

Cell biological processes including cell signaling, cell division, intracellular trafficking, biogenesis of organelles, cell adhesion and motility.

**MCDB 533: Advances in Developmental Biology**

(Cross-listed with GDCB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BIOL 314 or Biol 423*

Fundamental principles in multicellular development. Emphasis on cellular and molecular regulation of developmental processes, and experimental approaches as illustrated in the current literature.

**MCDB 545: Plant Molecular, Cell and Developmental Biology**

(Cross-listed with GDCB, PLBIO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Biol 313, BIOL 314, BIOL 330 or BBMB 405*

Plant nuclear and organelle genomes; regulation of gene expression; hormone signaling; organization, function, and development of plant cells and subcellular structures; regulation of plant growth and development.

**MCDB 590: Special Topics**

Cr. arr. Repeatable.

**Courses for graduate students:**

**MCDB 697: Graduate Research Rotation**

Cr. 1-6. Repeatable. F.S.

Graduate research projects performed under the supervision of selected faculty members in the molecular, cellular, and developmental biology program.

**MCDB 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MICRO, V MPM). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**MCDB 699: Research**

Cr. arr. Repeatable.

## Neuroscience

### Neuroscience Interdepartmental Graduate Program

Work is offered for the master of science and doctor of philosophy degrees with a major in neuroscience. Cooperating departments include Animal Science; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Chemical and Biological Engineering; Chemistry; Ecology, Evolution and Organismal Biology; Food Science and Human Nutrition; Genetics, Development and Cell Biology; Kinesiology; Psychology; Veterinary Clinical Sciences; and Veterinary Diagnostic and Production Animal Medicine.

The diversity of faculty in the Interdepartmental Neuroscience major provides students with a variety of research opportunities and reflects the structure of contemporary neuroscience which has become a diverse and interdisciplinary field. Facilities and faculty are committed to research in the following areas: neuronal membrane functions,

signal transduction, neuroanatomy, neurodegenerative diseases, neuroendocrinology, neurotoxicology, neuropathology, developmental neurobiology, neurogenetics, computational neuroscience, neural networks, behavioral neuroscience, tissue engineering, neuroregeneration and brain repair. Additional information about program faculty members is available at: [www.neuroscience.iastate.edu](http://www.neuroscience.iastate.edu) (<http://www.neuroscience.iastate.edu/>).

An undergraduate or advanced degree in one of the basic or applied sciences is ordinarily a prerequisite for admission to the program. Typical program disciplines include majors in biochemistry, biology, biomedical sciences, human medicine, immunology, neurobiology, physiology, pharmacology, psychology, veterinary medicine, or zoology. Appropriate undergraduate coursework includes mathematics, chemistry, physics, and biological sciences. Prior research experience is highly encouraged. The submission of GRE General Test scores is required for admission.

Prospective students are admitted by the Neuroscience program following an internal application process and after review by the Neuroscience Admissions Committee. Students are admitted either to participate in research rotations with several faculty before deciding on a major professor and laboratory, or by direct admission into a specific lab and department. Ph.D. students typically enter via rotation and M.S. students typically enter via a direct admit. Those students entering through a rotation admit are required to complete a minimum of three research lab rotations with faculty of interest. At the end of their second semester, students on rotation must select a major professor from the faculty participating in the program.

## CURRICULUM REQUIREMENTS FOR NEUROSCIENCE GRADUATE STUDENTS

### M.S. Curriculum

Students seeking an M.S. degree must take a total of 30 credits, with not less than 22 credits earned at ISU. The following courses are the core curriculum. In addition, students are required to take a minimum of 6 credits of elective courses and an ethics course.

B M S 537	Neuroanatomy	3
KIN 572	Neural Basis of Human Movement	2-3
or NEURO 589	Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology	
NEURO 556	Cellular, Molecular and Developmental Neuroscience	3
NEURO 696	Neuroscience Seminar	1
NEURO 699	Research	arr †
PSYCH 519	Cognitive Neuropsychology	3

STAT 587	Statistical Methods for Research Workers	4
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† Arranged with instructor.

### Ph.D. Curriculum

Ph.D. candidates majoring in Neuroscience must take at least 72 graduate credits. These 72 credits includes the below core course requirements and applicable research credits earned. Credits taken during a student's M.S. program in Neuroscience at Iowa State University will count towards their Ph.D. in Neuroscience.

B M S 537	Neuroanatomy	3
KIN 572	Neural Basis of Human Movement	2-3
or NEURO 589	Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology	
NEURO 556	Cellular, Molecular and Developmental Neuroscience	3
NEURO 557	Rotations in Neuroscience	2
NEURO 661	Advanced Topics in Neuroscience (Repeatable)	3
NEURO 696	Neuroscience Seminar (Taken every fall & spring)	1
NEURO 699	Research	arr †
PSYCH 519	Cognitive Neuropsychology	3
STAT 587	Statistical Methods for Research Workers	4
MANDATORY ETHICS TRAINING: All Neuroscience students are also required to complete 1 credit hour of ethics training.		1

† Arranged with instructor.

In addition to the above coursework, all Neuroscience majors are expected to take a minimum of six credits of approved elective neuroscience courses.

Additional coursework for both Ph.D. and M.S. degrees is selected by the student in consultation with their POS Committee to meet departmental requirements and to satisfactorily prepare the student for their research project.

Graduate credits of B or better earned at another institution may be transferred at the discretion of the POS Committee and with the approval of the Neuroscience Program and the ISU Graduate College.

Additional information relating to credits required for graduate degrees can be found in the ISU Graduate College Handbook (<http://www.grad-college.iastate.edu/common/handbook/>).

### Curriculum Requirements for Graduate Students Seeking a Neuroscience Minor

Graduate students interested in completing a Neuroscience minor are required to complete 12 credits from the list below.



Students must be approved for the minor by the Neuroscience Program and must follow Graduate College guidelines for POS Committee membership.

Graduate students wishing to seek a minor in Neuroscience are encouraged to contact the Neuroscience Interdepartmental Graduate Program Coordinator for further information. Inquiries can be submitted to [idgp@iastate.edu](mailto:idgp@iastate.edu).

### Approved Neuroscience Minor Courses

B M S 537	Neuroanatomy	3
KIN 572	Neural Basis of Human Movement	3
NEURO 556	Cellular, Molecular and Developmental Neuroscience	3
NEURO 589	Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology	2
NEURO 696	Neuroscience Seminar	1
PSYCH 519	Cognitive Neuropsychology	3

**Courses primarily for graduate students, open to qualified undergraduates:**

#### NEURO 556: Cellular, Molecular and Developmental Neuroscience

(Cross-listed with B M S, GDCB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BIOL 335 or BIOL 436; physics recommended*

Fundamental principles of neuroscience including cellular and molecular neuroscience, nervous system development, and regulatory systems.

#### NEURO 557: Rotations in Neuroscience

(Cross-listed with GDCB). (2-0) Cr. 2. F.S.

Rotation experiences in various neuroscience research methods and techniques related to our current faculty specialties.

#### NEURO 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology

(Cross-listed with FS HN, GERON, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**Courses for graduate students:**

#### NEURO 661: Advanced Topics in Neuroscience

(Cross-listed with BBMB, GDCB, KIN). (3-0) Cr. 3. Repeatable. Alt. S., offered even-numbered years.

*Prereq: NEURO 556 (or comparable course) or permission of instructor*

Students will present three journal articles and two overview lectures on topics in neuroscience that are related but outside of their own research interest.

#### NEURO 696: Neuroscience Seminar

(1-0) Cr. 1. Repeatable. F.S.

Seminar in neuroscience, current research interests, and/or professional development.

#### NEURO 699: Research

Cr. arr. Repeatable.

## Nutritional Sciences GRADUATE PROGRAM

The Interdepartmental Graduate Program in Nutritional Sciences, administered through the Graduate College, under the auspices of the Chairs of Food Science and Human Nutrition (FS HN) and Animal Science, will provide the structure for coordinating and enhancing interdisciplinary nutrition research and graduate education. M.S. and Ph.D. degrees in Nutritional Sciences will be offered with three specializations: Animal Nutrition, Human Nutrition, or Biochemical & Molecular Nutrition.

The following undergraduate course work is recommended of all applicants who are applying to the Interdepartmental Graduate Program in Nutritional Sciences, but may be modified depending upon the student's area of emphasis. Recommended course work includes organic chemistry with laboratory, physics, analytical chemistry, a nutrition course that requires biochemistry or organic chemistry as a prerequisite, and a course in biology/physiology or anatomy. Under certain circumstances students can be admitted or provisionally admitted with course work deficiencies. Students with an undergraduate degree will be generally admitted into the M.S. program and upon completion, they can then apply for admission into the Ph.D. program. However, exceptional students with experience can apply directly to the Ph.D. program.

The general requirements of the Nutritional Sciences degree at the M.S. level, in addition to those of Graduate College, are:

NUTRS 501	Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients	4
BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
or BBMB 420	Mammalian Biochemistry	



STAT 587	Statistical Methods for Research Workers	4
FS HN 580	Orientation to Food Science and Nutrition Research	1
or AN S 501	Survey of Animal Disciplines	
AN S 603	Seminar in Animal Nutrition	1
or FS HN 682	Seminar Reflection	
FS HN 581	Seminar (or AN S equivalent)	1
FS HN 681	Seminar (or AN S equivalent)	1
FS HN 590C	Special Topics: Teaching	1-3
or AN S 590L	Special Topics: Teaching	
Successful completion and defense of thesis		

Students are expected to complete the course work established by the Program of Study (POS) committee based on specialization with a minimum of 30 graduate-level semester credits, not less than 22 of which must be earned at Iowa State University.

The general requirements of the Nutritional Sciences degree at the Ph.D. level, in addition to those of the Graduate College, are:

- Completion of all requirements of the M.S. degree in Nutritional Sciences
- 3 additional credits of graduate-level biochemistry (6 credits total including those for the M.S.), graduate-level statistics (STAT 471 Introduction to Experimental Design), and physiology (if not taken for the M.S.)
- Additional graduate-level courses in the field of study as deemed appropriate by the POS Committee and specialization, and additional teaching assistant requirements (FS HN 590C Special Topics: Teaching).

Satisfactory completion of a preliminary examination, a written dissertation, seminar presentation of dissertation research, and defense of the dissertation is also required. Overall a minimum of 72 graduate-level semester credits, no less than 36 of which must be earned at Iowa State University

## Plant Biology

(Interdepartmental Graduate Major)

The Interdepartmental Plant Biology major (IPB) coordinates graduate education and research in the areas of plant biology including but not limited to plant biochemistry, plant cellular and molecular biology and plant physiology. Graduate study in IPB, leading to the M.S. and Ph.D. Degrees, is offered through eight participating departments: Agronomy, Biochemistry, Biophysics & Molecular Biology, Chemical and Biological Engineering, Chemistry, Ecology, Evolution and Organismal Biology, Genetics Development & Cell Biology, Horticulture, and Plant Pathology.

Research conducted by the faculty and students of the major represents both basic and applied aspects of plant physiology, biochemistry and molecular biology. The experimental approaches represented in the major span the range of complexity from molecular studies, to cellular, organismal and the ecological level (crop monocultures and natural populations). Graduates have a broad understanding of basic, functional plant biology with emphases on fundamental biology, biochemistry, and molecular biology. They are able to address complex research and policy problems in agriculture, biotechnology, and basic plant biology.

## M.S. Program

A total of 36 credits, which includes a minimum of 16 course credits and at least a B grade or better, are required for an M.S.

All M.S. candidates take a core curriculum comprising courses recommended from the following four categories, attend research seminars (PLBIO 696), take research credits (PLBIO 699 Research), and attend the annual Loomis Distinguished Lecture and mini-symposium and retreats. Students will take additional courses of interest as directed by their Program of Study (POS) Committee members.

Required: Complete the following core courses:

STAT 587	Statistical Methods for Research Workers	4
BBMB 316	Principles of Biochemistry	3-6
or BBMB 404 & BBMB 405	Biochemistry I and Biochemistry II	
or BBMB 504 & BBMB 505	Amino Acids and Proteins and Bioenergetics and Metabolism	
GDCB 513	Plant Metabolism	2
GDCB 545	Plant Molecular, Cell and Developmental Biology	3
GR ST 565	Responsible Conduct of Research in Science and Engineering	1
PLBIO 696	Research Seminar *	1
PLBIO 699	Research	arr t

Optional Courses

AGRON 516	Crop Physiology
AGRON 625	Genetic Strategies in Plant Breeding
BBMB 531	Plant Biochemistry
BBMB 545	Molecular Signaling
BBMB 675	Nucleic Acid Structure and Function
BIOL 454	Plant Anatomy
BIOL 474	Plant Ecology
EEOB 553	Agrostology
EEOB 563	Molecular Phylogenetics
EEOB 566	Molecular Evolution

GDCB 510	Transmission Genetics
GDCB 511	Advanced Molecular Genetics
GDCB 528	Advances in Molecular Cell Biology
STAT 581	Analysis of Gene Expression Data for the Biological Sciences

† Arranged with instructor.

\* Required enrollment each semester; must present 2 talks; a maximum of 2 credits of 696 seminars are counted toward MS degree POSC. Make two seminar presentations and enroll each term in the Interdepartmental Plant Biology seminar PLBIO 696 Research Seminar. The first seminar must be during the student's first year and is a 20-minute seminar. The last presentation must be an exit seminar. In addition to the required core courses, a wide selection of courses is available to IPB graduate students for broadening their scientific education, and increasing knowledge in topics related to their research. Decisions about which courses are taken and when they are taken are made by the student, initially in consultation with their temporary advisor, and then with their major advisor and eventually with POS Committee, which also serves as the Thesis or Dissertation Committee.

## Ph.D. Program

A total of 72 credits, which includes a minimum of 24 course credits and at least a B grade or higher, are required for a Ph.D.

All Ph.D. candidates take a core curriculum comprising courses recommended from the following four categories, attend research seminars, research credits (PLBIO 699 Research), annual Loomis Distinguished Lecture in Plant Biology and mini-symposium and retreats. Students will take additional courses of interest as directed by their Program of Study (POS) Committee members.

Required: Complete the following core courses:

STAT 587	Statistical Methods for Research Workers	4
BBMB 316	Principles of Biochemistry	3-6
or BBMB 404 & BBMB 405	Biochemistry I and Biochemistry II	
or BBMB 504 & BBMB 505	Amino Acids and Proteins and Bioenergetics and Metabolism	
GDCB 513	Plant Metabolism	2
GDCB 545	Plant Molecular, Cell and Developmental Biology	3
GR ST 565	Responsible Conduct of Research in Science and Engineering	1
PLBIO 696	Research Seminar *	1
PLBIO 699	Research	arr †

Optional Core Courses: Must take one of the following

GDCB 510	Transmission Genetics
GDCB 511	Advanced Molecular Genetics
EEOB 551	Plant Evolution and Phylogeny
EEOB 566	Molecular Evolution
Optional Courses	
AGRON 516	Crop Physiology
AGRON 625	Genetic Strategies in Plant Breeding
BBMB 531	Plant Biochemistry
BBMB 545	Molecular Signaling
BBMB 675	Nucleic Acid Structure and Function
BIOL 454	Plant Anatomy
BIOL 474	Plant Ecology
EEOB 553	Agrostology
EEOB 563	Molecular Phylogenetics
EEOB 566	Molecular Evolution
GDCB 510	Transmission Genetics
GDCB 511	Advanced Molecular Genetics
STAT 581	Analysis of Gene Expression Data for the Biological Sciences

† Arranged with instructor.

\* Required enrollment each semester; must present 4 talks; up to 5 credits of 696 seminars are counted toward Ph.D. Enroll each term in the Interdepartmental Plant Biology seminar PLBIO 696 Research Seminar or its listed equivalent. The first seminar must be during the student's first year and is a 20-minute seminar. The last presentation must be an exit seminar. In addition to the required core courses, a wide selection of courses is available to IPB graduate students for broadening their scientific education, and increasing knowledge in topics related to their research. Decision about which courses to take and when they are to be taken are made by the student, initially in consultation with their temporary advisor, and then with their major advisor and eventually with their POS Committee, which also serves as the Thesis or Dissertation Committee.

## Requirements for students seeking a Minor in Plant Biology:

Ph.D. and M.S. candidates in other programs who desire a graduate minor in Plant Biology must take the required courses listed below, achieving a grade of B or better. One member of the student's POS committee must have IPB faculty membership.

Prerequisite Courses:

STAT 587	Statistical Methods for Research Workers	4
BBMB 404	Biochemistry I	3

9 credits from the following:

AGRON 516	Crop Physiology
BIOL 454	Plant Anatomy
GDCB 513	Plant Metabolism
GDCB 545	Plant Molecular, Cell and Developmental Biology

**Courses primarily for graduate students, open to qualified undergraduates:**

**PLBIO 513: Plant Metabolism**

(Cross-listed with GDCB). (2-0) Cr. 2. Alt. F., offered even-numbered years.  
*Prereq: BIOL 330, PHYS 131, CHEM 331; one semester of biochemistry recommended*  
Photosynthesis, respiration, and other aspects of plant metabolism.

**PLBIO 545: Plant Molecular, Cell and Developmental Biology**

(Cross-listed with GDCB, MCDB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.  
*Prereq: Biol 313, BIOL 314, BIOL 330 or BBMB 405*  
Plant nuclear and organelle genomes; regulation of gene expression; hormone signaling; organization, function, and development of plant cells and subcellular structures; regulation of plant growth and development.

**Courses for graduate students:**

**PLBIO 696: Research Seminar**

(Cross-listed with AGRON, BBMB, FOR, GDCB, HORT). Cr. 1. Repeatable. F.S.  
Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**PLBIO 699: Research**

Cr. arr. Repeatable.

Seed Science

Administered by the Departments of Agricultural and Biosystems Engineering, Agronomy, Horticulture, and Plant Pathology.

Seed Science must be taken as a secondary major in conjunction with a primary major. The seed science program is designed for students with career interests in one or more aspects of the seed industry. Areas of study focus on seeds including production, conditioning, pathology, physiology, quality control, marketing, and seed plant designs.

Student Learning Outcomes

Upon graduation, students should be able to:

1. Demonstrate understanding of the science and principles of seed production systems, including seed quality assessment and conditioning, and clearly communicate the importance of seeds to our society.

2. Articulate the opportunities in the seed industry for seed-related careers.
3. Apply seed science and technology knowledge for solving seed quality and production problems encountered in the seed industry.

CURRICULUM IN SEED SCIENCE  
(SECONDARY MAJOR)

**Total Degree Requirement: 128 cr.**

**COMPLETE COMMUNICATION AND LIBRARY REQUIREMENTS OF PRIMARY MAJOR AND 3 CR. FROM THE FOLLOWING:**

ENGL 302	Business Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 312	Communicating Science and Public Engagement	3
ENGL 314	Technical Communication	3
SP CM 312	Business and Professional Speaking	3

**BIOLOGICAL SCIENCES: 7 CR.**

BIOL 211	Principles of Biology I	4
& 211L	and Principles of Biology Laboratory I	
or BIOL 212	Principles of Biology II	
& 212L	and Principles of Biology Laboratory II	
AGRON 320	Genetics, Agriculture and Biotechnology	3
or BIOL 313	Principles of Genetics	

**PHYSICAL SCIENCES: 8-9 CR.**

CHEM 163	College Chemistry	5
& 163L	and Laboratory in College Chemistry	
or CHEM 177	General Chemistry I	
& 177L	and Laboratory in General Chemistry I	

One of the following:

AGRON 259	Organic Compounds in Plants and Soils	3
BBMB 221	Structure and Reactions in Biochemical Processes	3
CHEM 231	Elementary Organic Chemistry	4
& 231L	and Laboratory in Elementary Organic Chemistry	

**MATHEMATICAL SCIENCES 6 CR.**

MATH 140	College Algebra	3
or MATH 150	Discrete Mathematics for Business and Social Sciences	
Statistics course		3

**AGRICULTURAL SCIENCES: 28-29 CR.**

AGRON 181	Introduction to Crop Science	3
or HORT 221	Principles of Horticulture Science	
AGRON 182	Introduction to Soil Science	3
AGRON 206	Introduction to Weather and Climate	3
AGRON 217	Weed Identification	1-2
or AGRON 331	Crops Practicum	

AGRON 316	Crop Structure-Function Relationships	3
or HORT 321	Horticulture Physiology	
AGRON 354	Soils and Plant Growth	3
9 credits from AGRON, HORT, or TSM (6 credits at 300-400 level)		9

**ECONOMICS AND BUSINESS: 9 CR.**

ECON 101	Principles of Microeconomics	3
Six credits from the following:		6
ACCT 284	Financial Accounting	
ECON 102	Principles of Macroeconomics	
ECON 230	Farm Business Management	
ECON 234	Small Business Management	
ECON 235	Introduction to Agricultural Markets	
ECON 236	Agricultural Selling	
ECON 334	Entrepreneurship in Agriculture	
MGMT 370	Managing Organizations	
MKT 340	Principles of Marketing	

**SEED SCIENCE: 16 CR.**

AGRON 317	Principles of Weed Science	3
AGRON 338	Seed Science and Technology	3
AGRON 421	Introduction to Plant Breeding	3
ENT 376	Fundamentals of Entomology and Pest Management	3
PL P 408	Principles of Plant Pathology	3
One of the following:		
AGRON 311	Professional Internship in Agronomy (seed related)	1
AGRON 491	Seed Science Internship Experience	1-2
HORT 391	Horticultural Management Experience	1

**HUMANITIES: 3 CR.**

3 cr. from approved humanities list: <http://www.cals.iastate.edu/student-services/humanities> (<http://www.cals.iastate.edu/student-services/humanities/>)

**SOCIAL SCIENCES: 3 CR.**

3 cr. from approved social sciences list: <http://www.cals.iastate.edu/student-services/social-sciences> (<http://www.cals.iastate.edu/student-services/social-sciences/>)

**ETHICS: 3 CR.**

3 cr. from approved ethics list: <http://www.cals.iastate.edu/student-services/ethics> (<http://www.cals.iastate.edu/student-services/ethics/>)

**REMAINING CREDITS (STUDENT CHOICE).**

Because seed science is a secondary major, the courses taken by the student during the first year will vary, depending on the primary major (see typical program for the primary major).

## Seed Technology and Business

(Interdepartmental Graduate Major)

The Graduate Program in Seed Technology and Business (STB) offers students advanced study in the seed science and technology and business management appropriate for application in the seed sector. The STB program is focused on preparing students for seed-related management roles by training the next generation of seed leaders. The program is offered by departments in the Ivy Colleges of Business and Agriculture and Life Sciences: Accounting, Agronomy, Finance, Horticulture, Agricultural Biosystems Engineering, Management Information Systems, Management, Marketing and Plant Pathology. This multidisciplinary program offers a focused online curriculum for a Master of Science in Seed Technology and Business, along with Graduate Certificates in Seed Science and Technology and in Seed Business Management.

## ONLINE GRADUATE PROGRAM IN SEED TECHNOLOGY & BUSINESS

The curriculum offers a set of scientific and technical courses that are focused on seed, with a set of basic management courses, similar to those in the core courses of an MBA program. The business courses will use examples drawn from the seed industry. A creative component is required for the Master of Science degree.

Prerequisite for the program is a bachelor's degree in business, agriculture, other biological discipline, or related degrees. Graduate training in these disciplines will also be considered.

Graduates of the Graduate Program in Seed Technology and Business will be prepared for roles in management and leadership within private and public seed and seed-related organizations.

All of the courses listed below are required for the Master of Science degree. The pace of the course sequence is designed to allow the students with work and other commitments to participate. Students will complete the creative component under the guidance of their Program of Study Committee. In many cases, the creative component topic will be associated with the student's work.

Graduates of the Master of Science curriculum will be prepared for roles in management and leadership within seed related organizations, private and public.

## Master of Science in Seed Technology and Business

STB 501	Strategic Management	2
STB 503	Information Systems	2
STB 504	Marketing and Logistics	3
STB 507	Organizational Behavior	2

STB 508	Accounting and Finance	3
STB 509	International Seed Business Practices, Policies, & Regulation	3
STB 510	Crop Improvement	3
STB 513	Data Science for Agricultural Professionals	3
STB 534	Seed and Variety, Testing and Technology	2
STB 535	Introduction to the Seed Industry	1
STB 539	Seed Conditioning and Storage	2
STB 543	Seed Physiology	2
STB 547	Seed Production	2
STB 592	Seed Health Management	2
STB 595	Seed Quality, Production, and Research Management	2
STB 599	Creative Component	2-3

*The program also offers two graduate certificates:*

### Graduate certificate in Seed Science and Technology

STB/AGRON 510	Crop Improvement	3
STB/AGRON 513	Data Science for Agricultural Professionals	3
STB/AGRON 534	Seed and Variety, Testing and Technology	2
STB 535	Introduction to the Seed Industry	1
STB/AGRON 539	Seed Conditioning and Storage	2
STB/HORT 543	Seed Physiology	2
STB/AGRON 547	Seed Production	2
STB/PL P 592	Seed Health Management	2
STB/AGRON 595	Seed Quality, Production, and Research Management	2

### Graduate certificate in Seed Business Management

STB 535	Introduction to the Seed Industry	1
STB/BUSAD 501	Strategic Management	2
STB/BUSAD 503	Information Systems	2
STB/BUSAD 504	Marketing and Logistics	3
STB/BUSAD 507	Organizational Behavior	2
STB/BUSAD 508	Accounting and Finance	3
STB/BUSAD 509	International Seed Business Practices, Policies, & Regulation	3

Graduate certificate courses may be applied to the Master of Science in Seed Technology and Business. Those interested in these graduate certificates should contact the Program for details.

Information on application procedures and specific requirements of the major can be obtained at our website: <http://www.seedgrad.iastate.edu>

or by writing to [seedgrad@iastate.edu](mailto:seedgrad@iastate.edu) (<http://seedgrad@iastate.edu>).

**Courses primarily for graduate students, open to qualified undergraduates:**

#### STB 501: Strategic Management

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Critical analysis of current practice and case studies in strategic management with an emphasis on integrative decision making. Strategy formulation and implementation will be investigated in the context of complex business environments.

#### STB 503: Information Systems

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Introduction to a broad variety of information systems (IS) topics, including current and emerging developments in information technology (IT), IT strategy in the context of corporate strategy, and IS planning and development of enterprise architectures. Cases, reading, and discussions highlight the techniques and tactics used by managers to cope with strategic issues within an increasingly technical and data-driven competitive environment.

#### STB 504: Marketing and Logistics

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Integration of the business functions concerned with the marketing and movement of goods along the supply chain with the primary goal of creating value for the ultimate customer. Coordination of marketing, production, and logistics activities within the firm and with outside suppliers and customers in the supply chain.

#### STB 507: Organizational Behavior

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Understanding human behavior in organizations, and the nature of organizations from a managerial perspective. Special emphasis on how individual differences, such as perceptions, personality, and motivation, influence individual and group behavior in organizations and on how behavior can be influenced by job design, leadership, groups, and the structure of organizations.



**STB 508: Accounting and Finance**

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of fundamental topics in accounting and finance. Financial statement reporting and analysis for agriculture firms, corporate governance issues related to financial reporting, (e.g., Sarbanes-Oxley). Basic tools and techniques used in financial management, including stock and bond valuation. How to assess and use capital budgeting methods to evaluate proposed firm investments.

**STB 509: International Seed Business Practices, Policies, & Regulation**

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Cultural, financial, economic, political, legal/regulatory environments shaping an organization's international business strategy. Topics include entry (and repatriation) of people, firms, goods, services, and capital. Special attention to the institutions of seed regulation and policy. Ethical issues facing managers operating in an international context.

**STB 510: Crop Improvement**

(Cross-listed with AGRON). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

A study of agriculture from its origins with the domestication of crop plants through basic genetics, demonstrating the challenges and elements of breeding strategies intended to manage gene x environmental interactions. Elements of biotechnology including use of molecular markers, development of genetically modified cultivars, gene mapping, cloning, and gene editing will be covered. Methods to measure the effectiveness of plant breeding (genetic gain) and the impact of improved agronomic practices contributing to increased agricultural productivity will be covered. Use of intellectual property protection, and the conservation and utilization of exotic genetic resources.

**STB 513: Data Science for Agricultural Professionals**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, MATH 140, STAT 104*

Quantitative methods for analyzing and interpreting agronomic information. Principles of experimental design, hypothesis testing, analysis of variance, regression, correlation, and graphical representation of data. Use of SAS and Excel for organization, analyzing, and presenting data.

**STB 534: Seed and Variety, Testing and Technology**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The components of seed quality and how they are assessed in the laboratory, including traits derived from modern biotechnology. The impact of new technologies on seed quality testing. Variety maintenance procedures and breeder seed. Variety identification: phenotype and grow-out trials, isozyme testing, and DNA marker testing. Procedures for evaluating varieties. The variance tests appropriate for fixed effects analysis of variance. Statistical inference and stratification for yield trials. Use of strip plot testing.

**STB 535: Introduction to the Seed Industry**

Cr. 1.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

This introductory course is a quick overview of the academic program and the seed industry. It describes how the STB program components relate to the seed industry scope; the role of the seed industry in global agriculture and society; public and private institutions involved in seed research, development, and regulation; quality management for seed products. Current issues including industry consolidation, ethical and economic issues related to biotechnology, and incorporation of digital technology in the seed business will be discussed by course instructors and guest lecturers from the seed industry.

**STB 536: Quantitative Methods for Seed**

(Cross-listed with AGRON). (2-0) Cr. 2. F.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Quantitative Methods for analyzing and interpreting agronomic and business information for the seed industry. Principles of experimental design and hypothesis testing, regression, correlation, analysis of variance, and graphical representation of data. Use of spreadsheets and statistical software for manipulating, analyzing and presenting data.

**STB 539: Seed Conditioning and Storage**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The technical operations which may be carried out on a seed lot from harvest until it is ready for marketing and use. The opportunities for quality improvement and the risks of deterioration which are present during that time. Analysis of the costs of and benefits of operations. Evaluation of equipment based on benefits to the customer and producer. Interpretation of the role of the conditioning plant and store as a focal points within the overall operations of a seed company.



**STB 543: Seed Physiology**

(Cross-listed with HORT). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Brief introduction to plant physiology. Physiological aspects of seed development, maturation, longevity, dormancy and germination. Links between physiology and seed quality.

**STB 547: Seed Production**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of crop production; including management of soil fertility, planting dates, populations, weed control, and insect control. Analysis of the principles of seed multiplication and the key practices which are used to ensure high quality in the products. Field inspection procedures and production aspects that differ from other crop production. Foundation seed production. Analysis of the typical organization of field production tasks. Survey of the differences in seed production strategies between crops and the impact of these differences on seed production.

**STB 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Admission to the Graduate Program in Seed Technology and Business*  
Guided instruction and self-study on special topics relevant to seed technology and business.

**STB 592: Seed Health Management**

(Cross-listed with PL P). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Occurrence and management of diseases during seed production, harvest, conditioning, storage, and planting. Emphasis on epidemiology, disease management in the field, seed treatment, effects of conditioning on seed health, and seed health testing. Credit may not be obtained for both PI P/STB 592 and PI P 594.

**STB 595: Seed Quality, Production, and Research Management**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Advanced survey of the organization, staff capabilities and management characteristics typical in seed production and crop improvement in seed enterprises. Analysis of the use of quality information in the management of seed operations and sales. Process management applications for seed. Production planning for existing capacity. Analysis of the manager's tasks in the annual cycle and how the tasks of these managers relate to the general categories of business management roles. Difference in management strategies used with different situations and groups of employees.

**STB 599: Creative Component**

Cr. 1-3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

## Sustainability Minor

### OVERVIEW OF THE MINOR IN SUSTAINABILITY

Sustainability is often defined as "meeting the needs of today without compromising the ability of future generations to meet their own needs." The minor in sustainability at Iowa State University is available to any ISU student who wants to further learn about sustainability issues affecting humans today and in the future.

The interdisciplinary minor in sustainability exposes students to ideas and issues related to a sustainable, balanced and ethical future for the planet and its inhabitants. The minor is at the interplay between environmental, social and economic factors in improving the quality of human life within the capacity of supporting ecosystems.

The minor will help students understand the dynamics of biological population growth and decline in the natural world, predator-prey models, over-exploitation of natural resources, energy balances, and much more. Students also will study how human behavior affects the natural world and the ability of earth to sustain life and understand how the decisions they make as consumers, workers, resource owners, citizens and policymakers affect human welfare in this and future generations.

**Student Learning Outcomes**

As a result of their coursework for the sustainability program students will be able to:

- articulate why some environmental, social and economic profiles are sustainable and others are not.
- apply sustainable practices in their personal and professional lives.

The colleges of Agriculture and Life Sciences, Design, Engineering, and Liberal Arts and Sciences sponsor the minor in sustainability.

## REQUIREMENTS FOR THE MINOR IN SUSTAINABILITY

The minor in sustainability may be earned by completing a total of 15 credits including two required courses and nine elective credits from an approved list. Of the nine elective credits, at least six credits must be at the 300 level or higher. The minor must include at least 9 credits

that are not used to meet any other department, college, or university requirement.

### Required courses:

SOC 220	Globalization and Sustainability	3
ANTHR 230	Globalization and the Human Condition	3

### Emphasis Electives:

A B E 325	Biorenewable Systems	3
A B E 380	Principles of Biological Systems Engineering	3
A B E 388	Sustainable Engineering and International Development	3
A B E 480	Engineering Analysis of Biological Systems	3
AGRON 120	Introduction to Renewable Resources	3
AGRON 160	Water Resources of the World	3
AGRON 342	World Food Issues: Past and Present	3
AGRON 404	Global Change	3
AGRON 450	Issues in Sustainable Agriculture	3
ANTHR 336	Culture and Capitalism	3
ARCH 345	Building Science and Technology I	2
ARCH 346	Building Science and Technology II	3
ARCH 346L	Building Science and Technology II Lab	2
ARCH 347	Building Science and Technology III	3
ARCH 347L	Building Science and Technology III Lab	2
ARCH 348	Building Science and Technology IV	3
ARCH 348L	Building Science and Technology IV Lab	2
ARCH 445	Building Science and Technology V	2
ARCH 558	Sustainability and Green Architecture	3
ARCH 575	Contemporary Urban Design Theory	3
ARCH 597	Seminar on the Built Environment III: Theory	3
ARTIS 460	Sustainable Design and Fabrication of Furniture	3
ARTIS 465	Artists, Designers and Sustainable Development	3
ARTIS 466	Studio Abroad: Africa	3
BIOL 204	Biodiversity	2
BIOL 319	Analysis of Environmental Systems	3
BIOL 355	Plants and People	3
BIOL 471	Introductory Conservation Biology	3
BIOL 484	Ecosystem Ecology	3
C E 388	Sustainable Engineering and International Development	3
C R P 201	The North American Metropolis	3
C R P 291	World Cities and Globalization	3
C R P 293	Environmental Planning	3
C R P 320	Urban Geography	3

C R P 417	Urban Revitalization	3
C R P 429	Planning in Developing Countries	3
C R P 445	Transportation Policy and Planning	3
C R P 484	Sustainable Communities	3
C R P 491	Environmental Law and Planning	3
ECON 380	Energy, Environmental and Resource Economics	3
ECON 385	Economic Development	3
ECON 480	Intermediate Environmental and Resource Economics	3
E E 388	Sustainable Engineering and International Development	3
ENGL 355	Literature and the Environment	3
ENSCI 201	Introduction to Environmental Issues	2
ENSCI 319	Analysis of Environmental Systems	3
ENSCI 402	Watershed Hydrology	3
ENSCI 404	Global Change	3
ENSCI 480	Engineering Analysis of Biological Systems	3
ENSCI 484	Ecosystem Ecology	3
ENT 471	Insect Ecology	3
ENV S 101	Environmental Geology: Earth in Crisis	3
ENV S 108	Introduction to Oceanography	3
ENV S 120	Introduction to Renewable Resources	3
ENV S 160	Water Resources of the World	3
ENV S 201	Introduction to Environmental Issues	2
ENV S 204	Biodiversity	2
ENV S 270	Foundations in Natural Resource Policy and History	3
ENV S 293	Environmental Planning	3
ENV S 319	Analysis of Environmental Systems	3
ENV S 324	Energy and the Environment	3
ENV S 334	Environmental Ethics	3
ENV S 342	World Food Issues: Past and Present	3
ENV S 345	Population and Society	3
ENV S 355	Literature and the Environment	3
ENV S 380	Energy, Environmental and Resource Economics	3
ENV S 382	Environmental Sociology	3
ENV S 404	Global Change	3
ENV S 424	Sustainable and Environmental Horticulture Systems	3
ENV S 450	Issues in Sustainable Agriculture	3
ENV S 484	Sustainable Communities	3
ENV S 491	Environmental Law and Planning	3
FOR 452	Ecosystem Management	3

FS HN 242	The US Food System	3
FS HN 342	World Food Issues: Past and Present	3
FS HN 460	Global Nutrition and Health	3
GEOL 101	Environmental Geology: Earth in Crisis	3
GEOL 108	Introduction to Oceanography	3
GEOL 160	Water Resources of the World	3
GEOL 324	Energy and the Environment	3
GEOL 402	Watershed Hydrology	3
GLOBE 201	Introduction to Global Resource Systems	3
GLOBE 385	Economic Development	3
GLOBE 402	Responses to Global Resource System Challenges	3
HORT 424	Sustainable and Environmental Horticulture Systems	3
JL MC 347	Science Communication	3
JL MC 474	Communication Technology and Social Change	3
L A 270	Foundations in Natural Resource Policy and History	3
L A 302	Ecological Design	6
L A 491	Environmental Law and Planning	3
M E 433	Alternative Energy	3
M E 484	Technology, Globalization and Culture	3
MTEOR 160	Water Resources of the World	3
MTEOR 324	Energy and the Environment	3
MTEOR 402	Watershed Hydrology	3
MTEOR 404	Global Change	3
NREM 120	Introduction to Renewable Resources	3
NREM 270	Foundations in Natural Resource Policy and History	3
NREM 402	Watershed Hydrology	3
NREM 452	Ecosystem Management	3
NREM 471	Agroforestry Systems	3
PHIL 334	Environmental Ethics	3
PHIL 343	Philosophy of Technology	3
RUS 375	Russia Today	3
SOC 345	Population and Society	3
SOC 348	Global Poverty, Resources and Sustainable Development	3
SOC 382	Environmental Sociology	3
SOC 411	Social Change in Developing Countries	3
SUS E 501	Sustainable Design in Communities	5
SUS E 511	Sustainable Design Colloquium I	3
SUS E 521	Foundation of Sustainable Design	3
SUS E 531	Human Dimensions of Sustainability	3

SUS E 540	Methods for Sustainable Design	3
SUS E 550	Making Resilient Environments	3
TSM 324	Soil and Water Conservation Management	3
TSM 325	Biorenewable Systems	3
WLC 484	Technology, Globalization and Culture	3

## Toxicology

toxmajor@iastate.edu ([//toxmajor@iastate.edu](mailto://toxmajor@iastate.edu))

## Interdepartmental Graduate Major

Toxicology is the science of studying the adverse effects of substances on living organisms. Students observe, gather data and predict risks and outcomes in populations. Whole organism research and cellular and molecular approaches are used to determine toxicant exposure and mechanisms. Work is offered for the degrees doctor of philosophy and master of science. Students majoring in toxicology will be affiliated with one of the following cooperating departments: Agricultural and Biosystems Engineering; Animal Science; Biochemistry, Biophysics and Molecular Biology; Biomedical Sciences; Chemistry; Entomology; Food Science and Human Nutrition; Genetics, Development and Cell Biology; Geological and Atmospheric Sciences; Natural Resource Ecology and Management; Physics; Plant Pathology and Microbiology; Veterinary Diagnostic and Production Animal Medicine; Veterinary Microbiology and Preventive Medicine; and Veterinary Pathology.

The prerequisites for entrance into the graduate toxicology major include an undergraduate degree in a relevant area of study; for example, chemical engineering, biology, biochemistry, chemistry, ecology, entomology, food science and technology, microbiology, nutritional science, zoology, or veterinary medicine. Minimum undergraduate coursework should include the following or their equivalent:

- 1 year of college mathematics, including calculus
- 1 year of inorganic chemistry with quantitative analysis
- 1 course in physics
- 1 year of organic chemistry
- 2 years of biological sciences including 1 course in physiology

Other courses that are considered desirable in undergraduate preparation include: biochemistry, physical chemistry, qualitative analysis, and some specialized courses such as histology or advanced physiology.

Facilities and faculty are available for fundamental research in such areas as agricultural toxicology, drug discovery and prevention, ecotoxicology, environmental fate and effects of chemicals, insect toxicology, aquatic toxicology, food safety, nutritional toxicology, mycotoxins, neurotoxicology, cellular and molecular toxicology, reproductive toxicology, and veterinary toxicology.

Ph.D. and M.S. Students should register for TOX 689 (R) every fall and spring semester during their training.

## Curriculum

Students majoring in toxicology will be affiliated with a cooperating department. All Ph.D. students take a core curriculum consisting of:

TOX 501	Principles of Toxicology	3
TOX 502	Toxicology Methods	3
TOX 504	Toxicology Seminar (taken twice)	1
7 additional credits in approved toxicology courses		7
BBMB 405	Biochemistry II (2 additional credits of biochemistry courses)	
BBMB 404	Biochemistry I	
2 additional credits of upper level BBMB coursework. 3 credits in physiology, histology, pathology, neuroscience, immunobiology or cellular and molecular biology.		2 and 3
STAT 571	Introduction to Experimental Design	3
STAT 587	Statistical Methods for Research Workers	4
GR ST 565	Responsible Conduct of Research in Science and Engineering (or)	1
V PTH 554	Ethics in Scientific Research and Writing	1

M.S. students take a core of:

TOX 501	Principles of Toxicology	3
TOX 502	Toxicology Methods	3
TOX 504	Toxicology Seminar	1
3 additional credits in approved toxicology courses		3
BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
STAT 587	Statistical Methods for Research Workers	4
Additional coursework is selected to meet departmental requirements and to satisfy individual student research interests		
GR ST 565	Responsible Conduct of Research in Science and Engineering (or)	1
V PTH 554	Ethics in Scientific Research and Writing	1

A graduate minor in toxicology is available for students enrolled in other majors.

A minor for an M.S. degree includes one semester of TOX 689 and:

TOX 504	Toxicology Seminar	1
TOX 501	Principles of Toxicology	3
3 credits in other approved toxicology courses		3

A minor at the Ph.D. level includes one semester of TOX 689 and:

TOX 504	Toxicology Seminar	1
TOX 501	Principles of Toxicology	3
6 credits in other approved toxicology course work		6

One member of the student's program of study committee will be a member of the toxicology faculty.

Most students awarded doctoral degrees continue their training as postdoctoral associates at major research institutions in the U.S. or abroad in preparation for research and/or teaching positions in academia, industry, the military, veterinary research, or government environmental and public health institutions. A few go directly to permanent research positions in industry. Many students awarded master's degrees continue their training as doctoral students; however, some choose research support positions (i.e., technician, chemist, research associate) in academia, industry, or government. A more thorough list of outcomes is available at our Web site.

Graduates of the Toxicology major will be able to carefully design, execute and analyze experiments that extend the knowledge of toxicology and closely related sciences. They will be able to clearly communicate research findings, and thoroughly evaluate the literature of toxicology, contributing significantly to the advancement of the field.

### Courses primarily for undergraduates:

#### TOX 354: General Pharmacology

(Dual-listed with TOX 554). (Cross-listed with B M S). (3-0) Cr. 3. S.

*Prereq: B M S 549 and B M S 552; BBMB 404, BBMB 405*

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

#### TOX 401: Principles of Toxicology

(Dual-listed with TOX 501). (3-0) Cr. 3. F.

*Prereq: BBMB 404 or equivalent*

Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

#### TOX 419: Foodborne Hazards

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**TOX 420: Food Microbiology**

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**TOX 426: Veterinary Toxicology**

(Dual-listed with TOX 526). (Cross-listed with VDPAM). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**TOX 429: Foodborne Toxicants**

(Dual-listed with TOX 529). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A course in biochemistry*

Mechanisms of action, metabolism, sources, remediation or detoxification, risk assessment of major foodborne toxicants of current interest, design of HACCP plans for use in food industries targeting foodborne toxicants. Taught online only.

**TOX 450: Pesticides in the Environment**

(Dual-listed with TOX 550). (Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**TOX 490: Independent Study**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study with a faculty mentor. Intended for students enrolled in the Pharmacology and Toxicology minor. Students in the Pharmacology and Toxicology minor may use no more than 9 credits of university-wide 490 credits towards the total of 120 credits required for graduation.

**TOX 499: Undergraduate Research**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent research under faculty guidance. Intended for students enrolled in the Pharmacology and Toxicology minor. Offered on a satisfactory-fail basis only. Students may use no more than 9 credits of university-wide 499 credits towards the total of 120 credits required for graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**TOX 501: Principles of Toxicology**

(Dual-listed with TOX 401). (3-0) Cr. 3. F.

*Prereq: BBMB 404 or equivalent*

Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

**TOX 502: Toxicology Methods**

(0-6) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: TOX 501*

Provides demonstrations or laboratory experience in the application of methods used in toxicology, including safety procedures, calculation and data analysis, teratologic and morphologic evaluation, cellular/molecular toxicological techniques, electrophysiologic measures, in vitro enzyme induction/biotransformation, neural and behavioral toxicology testing.

**TOX 504: Toxicology Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

*Prereq: Permission of instructor required*

Presentation of a seminar about a current topic in toxicology as part of a weekly series of seminars by graduate students, faculty, and guest lecturers from off campus. Graduate student speakers will meet with the instructor at least one week prior to their formal presentation.

**TOX 515: Regulatory Toxicology**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: Graduate classification in the life or social sciences; undergraduate with permission of instructor.*

A survey course on risk analysis approaches used by toxicologists and other life and social scientists in government, industry and non-governmental organizations to inform regulatory policies and decisions under U.S. Federal statutes, including the Federal Food Drug and Cosmetic Act; the Food Quality Protection Act; the Federal Fungicide, Insecticide and Rodenticide Act; the Endangered Species Act; the Plant Protection Act; the National Environmental Policy Act; and the Toxic Substances Control Act. Topics covered include an overview of the roles and responsibilities of different U.S. Government Departments and Agencies in analyzing human; livestock and companion animal; and/or environmental risks and benefits of food products and food additives, cosmetics, drugs, pesticides, and consumer and industrial products.



**TOX 526: Veterinary Toxicology**

(Dual-listed with TOX 426). (Cross-listed with VDPAM). (3-0) Cr. 3. S.

*Prereq:* Third year classification in veterinary medicine, completion of TOX 501 or DVM degree

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**TOX 544: Aquatic Toxicology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq:* Graduate student status.

An overview of interactions between anthropogenic chemicals and aquatic ecosystems. Topics include history of aquatic toxicology, methods of toxicity testing, and species responses to toxicants. Emphasis is on aquatic pollutants of emerging concern (e.g., nanoparticles, microplastics).

**TOX 546: Clinical and Diagnostic Toxicology**

(Cross-listed with VDPAM). (0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* D.V.M. degree or VDPAM 526

Advanced study of current problems and issues in veterinary toxicology. Emphasis on problem solving and interpreting clinical cases while utilizing clinical, epidemiological, and laboratory resources. Course consists highly of clinical case based material.

**TOX 550: Pesticides in the Environment**

(Dual-listed with TOX 450). (Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq:* 6 credits of BIOL or Permission of Instructor

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**TOX 554: General Pharmacology**

(Dual-listed with TOX 354). (Cross-listed with B M S). (3-0) Cr. 3. S.

*Prereq:* B M S 549 and B M S 552; BBMB 404, BBMB 405

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

**TOX 565: Methods in Biostatistics and Epidemiology**

(Cross-listed with STAT). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* STAT 401 or STAT 500 or STAT 587; STAT 447 or STAT 543 or STAT 588

Statistical methods commonly used in epidemiology and human and animal health studies. Overview of cohort studies, case-control studies and randomized clinical trials. Topics include inference procedures for disease risk factors, analysis of time-to-event and survival data, analysis of longitudinal studies of disease progression and health status, diagnostic test evaluation, and meta-analysis. Examples will come from recent studies of physical and mental health, nutrition and disease progression in human and animal populations. Use of statistical software: SAS or R.

**TOX 569: Reproductive and Developmental Toxicology**

(Cross-listed with AN S). Cr. 2. Alt. F., offered even-numbered years.

*Prereq:* BBMB 301, BIOL 258 or An S 331

Chemical agents that target developmental and reproductive systems in animals and humans, both male and female. The influence that timeline of developmental in utero and what part of reproductive organ have on outcome of environmental exposures will be developed. The physiological changes due to exposure, and mechanistic pathways activated by xenobiotics will be defined and the consequences of these changes will be explored.

**TOX 570: Risk Assessment for Food, Agriculture and Veterinary Medicine**

(Cross-listed with AGRON, VDPAM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Statistics 300-level or higher.

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

**TOX 575: Cell Biology**

(Cross-listed with B M S). (3-0) Cr. 3. F.

*Prereq:* 10 credits in biological sciences and graduate student standing or permission of instructor

A multi-instructor course covering major topics in cell structure and function, including: universal features of prokaryotic and eukaryotic cells, types of utilization and conversion of energy, genetic control of cell shape and functionality, internal organization of cells, communication between cells and their environment, development of multicellular systems. Students have to write a term paper.

**TOX 590: Special Topics**

Cr. arr. Repeatable.

Contact individual faculty for special projects or topics. Graded.



Courses for graduate students:

**TOX 626: Advanced Food Microbiology**

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**TOX 627: Rapid Methods in Food Microbiology**

(Cross-listed with FS HN, MICRO). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**TOX 656: Cellular and Molecular Pathology II**

(Cross-listed with V PTH). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of carcinogenesis.

**TOX 675: Insecticide Toxicology**

(Cross-listed with ENT). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENT 555 or TOX 501*

Principles of insecticide toxicology; classification, mode of action, metabolism, and environmental effects of insecticides.

**TOX 689: Current Topics in Toxicology**

Cr. R. Repeatable. F.S.

Lecture and discussion participation on current topics in toxicology. An 80% attendance is expected to satisfactorily complete the course. Offered on a satisfactory-fail basis only.

**TOX 697: Graduate Research Rotation**

(0-12) Cr. 1-12. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Admission to Toxicology graduate program*

Graduate research projects performed under the supervision of selected faculty members in the graduate Toxicology major.

**TOX 699: Research**

Cr. arr. Repeatable. F.S.SS.

Research.

# Transportation

## Interdepartmental Graduate Major

The Master of Science in transportation offers opportunities for research in such areas as modeling and performance of transportation systems, highway safety and information systems, remote sensing, environmental analysis, techniques for urban and regional transportation system planning, environmental and social policy analysis of transportation systems, transportation policy analysis, analysis of transportation technologies, commodity distribution, public administration of the transportation planning process, regional development and transportation system interrelationships, transportation economics and finance, and planning for logistics management.

Students majoring in transportation will develop a program of study under the guidance of a program of study committee selected by the student in consultation with and approved by the chair of the faculty supervisory committee. The student's home department will be the major professor's primary department.

A student must complete at least 34 credits of acceptable work including preparation of a 6 credit thesis or a 2-3 credit creative component. A structured minor requires 12 credits of approved transportation courses and a thesis or creative component on a transportation related topic.

A required core includes:

C E 551	Urban Transportation Planning Models	3
C E 691	Seminar in Transportation Planning	1
STAT 587	Statistical Methods for Research Workers	4

Detailed requirements are available from the chair of the supervisory committee.

Graduate students pursuing a major in transportation are encouraged to consider a formal declared minor in transportation. Students considering a declared minor should consult with the chair of the supervisory committee about the requirements for it.

Students typically focus their program of study to support a career in one of five areas: transportation consulting, regional and statewide transportation planning, transportation service operations and management, transportation policy and economic analysis, and transportation planning and operation for local and state governments. Graduates will have specific knowledge in one or more of these focus areas and the skills to conduct research and analysis of transportation issues. These skills allow graduates to be productive immediately in positions related to a focus area or to continue in more advanced transportation graduate work.

# Wind Energy Science, Engineering and Policy

## Graduate Study

Wind Energy Science, Engineering and Policy (WESEP) is an interdisciplinary Ph.D. program that prepares graduates for wind energy related careers in industry, academia, and government institutions. WESEP is a unique integration of engineering, science, and policy-related disciplines that provides students with an opportunity for breadth and depth in their program of study.

Students take a set of 11 courses and participate each semester in a one-credit seminar course. Of the 11 courses, two courses are introductory wind energy courses, eight are core courses, and one is an advanced specialization course in wind energy. The seminar course will address research methods and communications in science and engineering. Students are also required to pass a qualifying examination in the first 18 months of their program, a preliminary oral examination generally taken by the end of year three, and a final oral defense with written dissertation to complete the program.

Of the eight core courses, students select five courses from a primary thrust area, providing disciplinary depth, and three courses from a secondary thrust area, providing interdisciplinary breadth. Students can take additional courses within the other thrust areas as needed for their research, but this requirement ensures students are research-capable in two thrust areas.

### WESEP Thrust areas

- Wind resource characterization and aerodynamics of wind farms
- Wind energy conversion system and grid operations
- Manufacturing, construction, and supply chain
- Turbine reliability & health monitoring
- Economics, policy and public perception

### Admission Requirements

Applicants should have an undergraduate GPA of at least 3.0 (B average) and a B.S. degree from a calculus-based undergraduate curriculum. A calculus-based undergraduate curriculum is one in which students take the equivalent of two years of calculus, covering differential and integral calculus, multivariable and vector calculus, and differential equations, and one year of physics, covering mechanics, thermodynamics, electric circuits, electromagnetics, and optics. The GRE is not required. Applicants who do not meet these general standards will be evaluated on an individual basis.

# GRADUATE COLLEGE

[www.grad-college.iastate.edu/](http://www.grad-college.iastate.edu/) (<http://www.grad-college.iastate.edu/>)

William R. Graves, Dean  
 Elena Cotos, Associate Dean  
 Heather Greenlee, Associate Dean  
 Michelle Soupir, Interim Associate Dean

The Graduate College and graduate faculty at Iowa State University are responsible for the quality of graduate education, for administering students' graduate programs, and for promoting research support from various governmental, industrial, and private agencies.

The graduate faculty in various programs handle admission and classification of graduate students, establish requirements for advanced degrees, and have charge of instruction and research at the graduate level. Graduate faculty members also teach graduate courses, serve on program of study (POS) committees, and direct work of master's and doctoral students. All graduate courses offered for major or nonmajor credit are taught by graduate faculty members or graduate lecturers.

Graduate study was offered soon after the university was founded, and the first graduate degree was conferred in 1877. Experimentation and research also started early, first in agriculture and shortly thereafter in home economics, engineering, science, and veterinary medicine. In 1913, the graduate faculty was organized formally and an executive graduate committee was appointed. In 1915, the graduate faculty held its first meeting, and in 1916, it granted the first doctor of philosophy degree.

Graduate education is vital to the quality of university teaching. The creative efforts of graduate faculty members and graduate students result in knowledge necessary to help society solve problems in educational, scientific, technological, and socio-economic areas. The Graduate College encourages educational exchange and contact with undergraduate areas of the university to promote improved teaching on both the undergraduate and graduate levels. A part of this exchange is accomplished by the publication of books and technical articles which are made possible by graduate research.

The degrees master of arts, master of science, and doctor of philosophy are research oriented. In many fields master's degrees are also awarded without a thesis, but a written report of independent study, called a creative component, is generally required. Coursework only degrees are available for those individuals interested in advanced study directed toward meeting vocational or professional objectives. Information on other types of Master's degrees can be found in the Graduate College Handbook, Appendix E (<https://www.grad-college.iastate.edu/handbook/appendix.php?id=E>).

The Graduate College Handbook (<https://www.grad-college.iastate.edu/handbook/>) lists policies and procedures of the Graduate College.

## Graduate Appointments

Graduate assistantships, fellowships, and research grants have been established at Iowa State University to encourage graduate work and to promote research. Such appointments and research opportunities are available through the various departments of instruction and the research centers on campus.

Graduate assistantships, the most common form of graduate student support, are available in three categories: the research assistantship, the teaching assistantship, or the administrative assistantship. A half-time graduate assistantship (20 hours per week) permits the holder to enroll for a maximum of 12 semester credits. Recipients of these assistantships are assessed fees at full Iowa resident rates regardless of the number of credits for which they register. These students may also be eligible for tuition scholarship awards (50% of in-state tuition for most master's students and 100% of in-state tuition for most Ph.D. students and certain terminal master's students). Students who are graduates of a regionally-accredited college or university in the United States or of a recognized institution in another country whose requirements for the bachelor's degree are substantially equivalent to those of Iowa State University, and who present the requisite undergraduate or graduate preparation, may apply for these appointments.

Students placed on academic probation are eligible for assistantship appointment only on a term by term basis and need special permission to be approved for tuition scholarships. Students admitted as nondegree students are not eligible for assistantship appointments. Further information may be obtained by contacting the appropriate graduate program.

The satisfactory completion of one appointment, plus satisfactory academic performance, will ordinarily make a student eligible for reappointment. After a period of three years of full time study for the master's degree or five years for the doctorate, the student will not normally be continued on assistantship support (shorter periods may be stipulated by the student's program or department).

## Postdoctoral Study

Opportunities are provided for postdoctoral study through the extensive research programs of the university. Inquiries should be directed to the appropriate program, institute, or to the Postdoctoral Scholar Coordinator in the Graduate College.

## Graduate Study by Staff Members

Any full-time member of the research, instructional, or extension staff at the rank of instructor, research associate, or assistant scientist may carry up to six course credits per semester and three credits per summer

session, subject to the approval of the head of the program or section, and provided it does not interfere with other duties. This privilege may be extended to members of the research, instructional, or extension staffs at the rank of assistant professor with approval of the college dean and the Dean of the Graduate College. Staff members at the rank of professor or associate professor cannot become candidates for graduate degrees from ISU.

## Distance Education

Iowa State offers many graduate degree and certificate programs off-campus. For a listing of the degree programs, registrations for courses, and more information about distance education, consult the Iowa State University Web site at <http://www.distance.iastate.edu> (<http://www.distance.iastate.edu/>).

Other information about graduate requirements is available in the Graduate College Handbook at <http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>. (<http://www.grad-college.iastate.edu/publications/gchandbook/homepage.html>)

## Graduate Courses Taken by Undergraduates

Certain graduate-level courses listed in the ISU Catalog may be used in the program of study even though they were taken for undergraduate credit by the student as an undergraduate at Iowa State University.

The following conditions must be met:

1. With approval of the student's Program of Study Committee, up to 6 graduate credits a student earned as an ISU undergraduate may be used to meet the requirements of the graduate degree.
2. Grades of B or better are required in the courses that led to these credits.
3. These credits must have been earned when the student was classified as an undergraduate, not as a nondegree undergraduate (special) student.
4. These credits could have been used to meet undergraduate degree requirements.
5. For students in concurrent undergraduate and graduate status, these credits (up to 6) may be in addition to the 6 credits identified on the Transfer of Courses for Concurrent B.S./Graduate (<http://www.grad-college.iastate.edu/common/forms/>) form.

## Courses Taken as a Nondegree Undergraduate Student

A person classified as a "nondegree undergraduate" student may not use courses taken under that status in a graduate degree program. A student

who has received the baccalaureate degree must register as a graduate student if they are to receive graduate credit for courses.

## Graduate Majors

A complete list of all graduate majors can be found on the Graduate College website, <https://www.grad-college.iastate.edu/academics/programs/apprograms.php>, with links to admission requirements and program websites.

The Graduate College oversees the admission of students to pursue a graduate degree or credential or to take graduate courses in nondegree student status. The Office of Admissions and the various graduate programs partner with the Graduate College to sustain an admissions process that respects institutional standards and the diverse needs of faculty and students across all realms of advanced study and scholarship. The Graduate College sets baseline admission requirements for the university and makes admission decisions. Graduate programs share specific admissions requirements to prospective students via their websites and the Graduate College Program Pages (<https://www.grad-college.iastate.edu/academics/programs/apprograms.php>).

## Application process

All application materials for graduate study are submitted via the online application.

The Graduate College establishes dates to open and close applications for particular academic terms. Graduate programs may establish deadlines earlier than the date on which the application closes by which applicants must submit all required materials to be considered for admission.

Departments and programs convey recommendations concerning admission to the Graduate College. Final decisions regarding admission rest with the Dean of the Graduate College. The Graduate College, or the Office of Admissions acting on behalf of the Graduate College, will seek to ensure the authenticity of application materials. Graduate programs are expected to uphold ethical practices as they evaluate applicants by using principles of holistic review. Official letters to applicants to report the outcomes of their applications are sent from the Dean of the Graduate College.

## Application requirements

Required Application Documents

1. Online graduate application
2. Unofficial transcripts from all previously attended institutions for undergraduate and post-baccalaureate study
  - a. Official transcripts are only required from applicants admitted to the Graduate College. Electronic copies provided by the applicant are not considered official.

3. Applicants whose first language is not English must submit a valid, official test report from the Test of English as a Foreign Language (TOEFL) or from an approved alternative examination. Applicants who otherwise would need to submit scores are exempt if they hold baccalaureate or higher degrees from countries where the only official language is English.
4. A statement of purpose for each major to which the applicant is applying.
5. Additional documents such as letters of recommendation, résumé/ curriculum vitae (CV), statement of purpose, writing samples, publications, portfolio, etc. may be required by programs.

## Admission standards and requirements

A baccalaureate degree, or equivalent from a suitably accredited college or university is required. Evidence of a conferred baccalaureate is needed by the start of the second semester of graduate study. Any exceptions to this admission standard must be approved by the Dean of the Graduate College.

A cumulative grade point average of 3.00 on a 4.00 scale, or equivalent, in undergraduate work or in previous graduate work is expected.

Recommendations from graduate programs to admit applicants who do not meet this standard will be reviewed by the Graduate College. The GPA may also be met through one of the following:

- Undergraduate degree with GPA greater than 3.00 (on a 4.00 scale)
- Completed 9 to 14 credits of graduate coursework with grade B or better in all courses
- Completed 15 or more credits of graduate coursework with GPA above 3.00 and no F grades

Minimum scores for tests of English are shown below. Graduate programs may set higher minima for applicants to their programs.

Students whose first language is English or those who earned degree from countries where the only official language is English are exempt from the language proficiency requirements.

Applicants whose native language is not English must demonstrate proficiency in English equivalent to a Test of English as a Foreign Language (TOEFL) score of at least 550 on the paper-based test, or 79 on the internet-based test as a part of the admissions process. International students may also submit IELTS (International English Language Testing System) scores in lieu of the TOEFL. The ISU Graduate College minimum is 6.5.

## Special applicants

**Non-degree seeking** - Nondegree seeking graduate students are those who are not seeking a graduate degree. There is a limit to the number of courses taken in this status that may be used to satisfy graduate degree

requirements. Non-degree seeking students are not eligible for financial aid.

**Re-admission** - Previous applicants to the Graduate College who did not enroll within one academic year of admission must submit a new application and pay the required fee because the prior application is no longer valid.

**Re-entry** - Applicants who previously were active students within the Graduate College, have not registered for four or more consecutive fall and spring semesters, and seek readmission to the same degree program should submit a re-entry application through the reinstatement process.

**In-Session** - Current graduate students who seek to pursue additional graduate degrees should complete an in-session status change application. The DOGE or DOCS (or designee) is responsible for approving the admission to the new major and submitting the form to the Graduate College

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## Registration

Registration processes are administered through the Office of the Registrar. Policies regarding tuition, fees, and residency should be directed to the Registrar.

All students who attend classes at ISU must register and pay assessed tuition and fees. The ISU Office of the Registrar's website at <http://www.registrar.iastate.edu/> is the official source of information about registration for all students at ISU. Specific dates for registration are listed:

- on the Registrar's Web page,
- on the University Calendar, and
- in the Iowa State Daily

Registration for summer session should be completed during the spring at the same time as registration for fall semester. All students are encouraged to register for courses on the Web through AccessPlus.

Detailed instructions are provided at <http://www.registrar.iastate.edu/students/registration/>.

For complete information on registration, see the ISU Schedule of Classes or the Registration Web site at <http://www.registrar.iastate.edu/students/>.

## Full-Time Status

During the academic year, graduate students not on assistantship must be registered for a minimum of nine credits to be considered full-time students or five credits to be considered half-time students. Students on

an assistantship appointment during the academic year are considered full-time.

## CREDIT LIMITS

Registration in credit courses is limited to a maximum of 15 credits per semester (10 credits for summer session) for graduate students, per Board of Regents. See the Graduate College Handbook Ch.2.1.2 (<https://www.grad-college.iastate.edu/handbook/chapter.php?id=2>) at for more details.

## Doctoral Post Prelim (Required Registration)

Even when Ph.D. graduate students have completed coursework, they are required to register and pay tuition and fees after successfully passing their preliminary oral examination, whether or not university facilities and equipment are used or staff is consulted—either in person or in absentia.

After the preliminary oral examination is passed (with either full or conditional pass) and if university facilities, equipment, and staff time are used, the Ph.D. candidate must register for the appropriate number of credits in the major program and pay the appropriate graduate tuition and fees. The Ph.D. candidate may register for GR ST 681 Required Registration and pay the Doctoral Required Registration tuition and fees if all other coursework is completed.

The Ph.D. candidate must be aware that registration for GR ST 681 is allowed only after the Ph.D. candidate passes the preliminary oral examination; is required only in the fall and spring semesters, and not during the summer term; is not allowed after the completion of the final oral examination; and does not defer student loans.

If students take the final examination during the interim between terms (including the first day of classes), registration can be for the term either before or after the examination is held.

## Auditing

Audit registration means taking courses without receiving formal credit. Audit provisions are as follows: Instructors must approve ALL audits; students must register for audits by day 10 of the semester; changes to or from an audit must be made in the first 10 days of the semester; students are assessed tuition and fees as though they were taking the course for credit; and the course DOES NOT count in determining full-time student status.

Audited courses do not appear on the student's permanent record unless the "Request for Audit(s) to Appear on Transcript" form is completed and signed by the student, course instructor, and major professor. Copies of this form, which are available from the Graduate College or from the Graduate College's web site at <https://www.grad-college.iastate.edu/>

student/forms/ must be filed with the Graduate College, 1137 Pearson Hall.

After the fifth class day, if a student changes a regular course to an audit, that course will appear on the student's permanent record as a drop. Audits are not acceptable as registration for loan deferments or for meeting visa requirements.

## Grading

Grades are the permanent official record of a student's academic performance. Iowa State uses A through F grading for most courses. S, P, and NP grades are given in some courses. The standard four-point scale is used to calculate a grade point average.

### Grade Point Average (GPA)

All courses taken as a graduate student will be calculated into the graduate GPA, except for Creative Component/Research (599 and 699) credits, which are not used in the calculation of the GPA. The GPA is determined by dividing the number of grade points earned by the total number of ISU cumulative hours. The grade given when an incomplete (I) is resolved is figured into the cumulative grade point average, but not into a particular semester's average. Marks of I, S, P, NP, T, and X are not counted in the grade point average; a mark of F (even if taken S/F) is counted in the grade point average. In the case of repeated courses, only the grade achieved the most recent time the course is taken is used in computing the grade point average. (However, grades in courses that are noted as repeatable courses in the catalog, such as certain repeatable seminars, will all be used in calculating the grade point average.)

### Grading Research and Creative Component Credits

Creative Component/Research credits may be graded as A, B, C, D, I, S, or F. Plus and minus grades are optional. These credits are not calculated in a student's GPA.

### Pass (P)/Not Pass (NP) Course Credit

Pass/Not Pass courses are those that a student, with the approval of the major professor, may take for personal enrichment, but not for satisfying prerequisites or deficiencies in the undergraduate background. P/NP marks may not be used in a POS (except for the Spring 2020 semester), nor do P/NP marks contribute to the student's GPA. Full credit for P/NP courses is used in calculating tuition assessment and credit load limitations. For more information, see the Graduate College Handbook.

### Satisfactory/Fail (S/F) Grading

S/F grading is not the same as P/NP grading. S/F grading is by instructor option; all students in a particular course receive S/F grading. P/NP grading is generally a student option. A P mark is equivalent to at least a C grade whereas an S mark is equivalent to at least a B grade at the graduate level. No special registration procedures are required for S/F grading. An S mark in a course taken S/F is not counted in the grade



point average, but an F mark in a course taken S/F is counted in the grade point average and is equivalent to an F in a regularly graded (A-F) course. No more than 20 percent of the total credits (excluding creative component, thesis or dissertation research) in the program of study may be earned on an S/F basis.

S/F grading may be used only for approved courses offered as seminars, symposia, workshops, special topics, and research. Programs must submit requests for S/F grading to the Dean of the Graduate College. The Graduate College Catalog and Curriculum Committee reviews and approves or rejects all S/F courses.

## Grievances about Grades

A graduate student who feels that a course grade has been unjustly assigned, and whose attempts to resolve the matter with the instructor have failed, may appeal through the grievance procedures described in Ch.9.5.1. of the Graduate College Handbook (<https://www.grad-college.iastate.edu/handbook/chapter.php?id=9#9.5>).

## Probation

If a graduate student does not maintain a cumulative 3.00 grade point average on all coursework taken, exclusive of research credit, they may be placed on academic probation by the Dean of the Graduate College. Grades earned by graduate students in undergraduate courses are included in the calculation of the grade point average. Academic probation judgments are made on the basis of grades in coursework only. New, first-term, degree seeking graduate students who fall below a 3.00 GPA at the end of their first semester will be given a one term grace period to bring their grades back to a 3.00 GPA. These students will receive a warning letter from the Graduate College.

While on academic probation a student will not be admitted to candidacy for a degree and, if appointed to a graduate assistantship, the student will not receive a graduate tuition scholarship unless approval is given by the student's home department's academic college. If a student is to qualify for a tuition scholarship, they must be removed from probation by the tenth class day of the term.

To ensure that registration does not take place without a review by the program, the Graduate College places a hold on future registrations by a student on probation. Before the student registers for each term, the program must review the student's record and recommend in writing if the Graduate College should permit further registration. Before graduation is approved, the student must complete all courses listed on the program of study with a minimum grade of C and have achieved a 3.00 GPA or greater.

## English Proficiency - Admission

Applicants whose native language is not English and who have not earned a bachelor's or master's in a country where the only official

language is English are required to submit Test of English as a Foreign Language (TOEFL) scores as part of the admission process. A minimum score of at least 79 on the TOEFL internet-based test or 550 on the paper-based test is required by the Graduate College. International students may also submit IELTS (International English Language Testing System) scores in lieu of the TOEFL. The ISU Graduate College minimum is 6.5. Because many programs require higher TOEFL and/or IELTS scores, applicants should check directly with the program to which they desire admission or browse the Graduate College website at [www.grad-college.iastate.edu/programs/APprograms.php](http://www.grad-college.iastate.edu/programs/APprograms.php) (<http://www.grad-college.iastate.edu/programs/APprograms.php>).

## English Requirement - graduation

Graduate students whose native language is not English and who did not graduate from a U.S. institution must take an English Placement Test at the beginning of their first semester of enrollment. This test is administered by the Department of English. A student who does not pass this examination is assigned to one or more courses in the English 99 and 101 series. This course work must be completed during the first year of study. (There is a developmental course fee for the English 99 course.). Non-native English speaking ISU graduate students who meet or exceed the TOEFL scores (640 or above on the paper-based test or 105 on the internet-based test) are exempted from taking the English Placement Test. (Self-enrollment in English 99 or 101 courses remains possible).

## Oral english certification test - teaching assistantships

New teaching assistants (TAs) whose native language is not English are evaluated for their ability to communicate effectively in English before their assistantship assignments are made. The Oral English Certification Tests (OECT) are given before the beginning of each semester. The testing dates are announced on the International Teaching Assistants (ITA) program website. Registration for the test is held online through links posted on the ITA program homepage, <https://cce.grad-college.iastate.edu/speaking/english-180-courses> (<https://cce.grad-college.iastate.edu/speaking/english-180-courses/>), two to three weeks before the test is administered. TAs and faculty with questions about OECT testing should contact the Center for Communication Excellence (CCE) in the Graduate College. A prospective teaching assistant who does not pass these tests is required to successfully complete coursework and be retested. English 180 is a series of communication courses designed to help new teaching assistants. Students focus on pronunciation, listening, question-handling, teaching and lecturing skills, and analyzing the culture of U.S. university life. Because enrollment is restricted, TAs cannot register for the courses online through AccessPlus. TAs must go to the CCE, 1137 Pearson Hall, immediately after they receive the test scores to obtain permission to enter the course by completing a course add slip.

## Changes in graduate program or status

Students who have been admitted to a graduate program and to the Graduate College may request to transfer at a later date to another major or degree. Because graduate students are admitted to particular programs, transfers require the approval of both the receiving program and the Graduate College. Students seeking transfer to another major or degree should first discuss their wishes with the new program DOGE (Director of Graduate Education) to determine requirements and interest by the new program. When a student receives a favorable preliminary response from the new program, they should fill out the student portion of the "Transfer From One Major/Degree/Certificate to Another (<https://iastate.box.com/s/0hg0ag2ietm5g72nrfhxg7wnwo20t9hj/>)" form and submit it to their current DOGE. The current DOGE will fill out the Current Program Information adding any comments they believe the new program should consider and forward the form to the proposed new program. This form is available from the Graduate College website at <https://www.grad-college.iastate.edu/student/forms/>.

The receiving program will generally give the student the same consideration and employ the same admissions standards that are used for original applications for admission and will expect the same application materials (transcripts, letters of recommendation, test scores, etc.). During this process, the new and old programs and the Graduate College are authorized and encouraged to seek and disclose information related to the student's overall fitness for studies in the receiving program. Programs are authorized to inquire into the student's prior conduct at the university, both with the prior program and with the Dean of Students.

Upon program action (acceptance or denial), the request to transfer form must be sent to the Graduate College for approval. Students desiring to transfer from a degree-seeking status to a nondegree-seeking status need to fill out the "Transfer from One Major/Program/Department to Nondegree (<https://iastate.box.com/s/sffio2c4lvfbtizrsxzsrwzgw0kjbjdj/>)" form available at <https://www.grad-college.iastate.edu/student/forms/> and send it to the Graduate College. Students desiring to transfer from nondegree-seeking status to a degree-seeking status must be admitted by a program through the regular graduate admission process. Students who are in interdepartmental majors should complete the Home Department form to change departments.

## Curriculum Change from Active Graduate to Active Undergraduate Status

Individuals who are in good standing in the Graduate College and who wish to transfer to an undergraduate curriculum must contact Office of the Registrar.

## Curriculum Change from Inactive Graduate to Active Undergraduate Status

Individuals who were admitted to the Graduate College more than one year ago and who do not have active graduate status but who wish to change their status from inactive graduate to active undergraduate must follow the same procedures required of reentering undergraduate students and must begin the process by filing a completed "Undergraduate Reentry" form with the Office of the Registrar. When considering reinstatement, the undergraduate college may consider the student's overall fitness for continued studies including information about the student's conduct, employment, and education since the student's last enrollment.

## Undergraduate Admission to Concurrent Graduate Degree/Certificate Programs

Several programs provide opportunities for qualified ISU juniors and seniors majoring in those curricula to apply for admission to both a bachelor's and master's degrees.

The graduate degree will be awarded only at the same time as, or after, the undergraduate degree is conferred. For a complete listing of the concurrent degree programs, consult Ch.4.3.2 (<https://www.grad-college.iastate.edu/handbook/chapter.php?id=4#4.3>) of the Graduate College Handbook.

Interested students must adhere to the following process:

- Complete the "Concurrent Enrollment for Undergraduate Student Wishing to Pursue a Graduate Certificate or Degree (<https://www.grad-college.iastate.edu/student/forms/>)" form on the Graduate College website.
- Take the form to the interested graduate program along with three letters of recommendation, and any other application materials required by the program, as listed on the Program's Admissions Requirement page here (<http://www.grad-college.iastate.edu/academics/programs/apprograms.php>).
- After the program has made an admissions decision and signed the form, it must be taken **in order** to the other areas (the program DOGE, undergraduate department, undergraduate college, and Graduate College).
- The Graduate College will make the final decision if the student is admissible and notify all parties including the Office of Admissions on the outcome of its evaluation.

Students interested in a research career may apply for graduate research assistantships during their last two years of study. Students should contact the graduate programs about applying to the graduate program early in their undergraduate careers. For more information about seeking admission to concurrent undergraduate/graduate degree programs

that are not pre-approved by the Graduate College, or "individualized programs", the application process, and transferring credits, consult Ch. 4.3.2 of the Graduate College Handbook.

## GRADUATE STUDENTS IN CONCURRENT UNDERGRADUATE PROGRAMS

Graduate students interested in enrolling in a concurrent undergraduate program should contact the Office of Admissions (100 Enrollment Services Center) to obtain admission information (even if the student has been previously admitted as an undergraduate). An "Application for Graduate Student Wishing to Pursue a Concurrent Undergraduate Degree" form should be obtained from the Graduate College Web site at [www.grad-college.iastate.edu/common/forms/index.php](http://www.grad-college.iastate.edu/common/forms/index.php) (<http://www.grad-college.iastate.edu/common/forms/>) and circulated for the appropriate approvals.

- Official enrollment and fee payment will be as a graduate student.
- The graduate degree or graduate certificate will be awarded only at the same time as, or after, the undergraduate degree is conferred.
- Students interested in a research career may be able to apply for a graduate research assistantship while in a concurrent degree or graduate certificate program.
- Students in concurrent degree programs may, subject to Program of Study Committee approval, count up to 6 ISU credits taken during their concurrent enrollment toward both a bachelor's degree and a graduate certificate or master's degree that requires up to 41 credits. For master's degree programs that require at least 42 credits, students may instead count up to 12 ISU credits taken during their concurrent enrollment toward both their undergraduate degree and their master's degree, upon program and Program of Study Committee approval.
- For students pursuing a concurrent undergraduate bachelor's degree and a graduate certificate, at least 12 graduate credits cannot be double counted and a maximum of 6 graduate credits can be double counted for both the bachelor's degree and the graduate certificate (when the graduate certificate requires more than 12 credits).
- A student in a bachelor's and master's concurrent degree program cannot be on a Ph.D. track during the concurrent program.

## Veterinary Medicine Students in Concurrent Graduate Degree/Certificate Programs

Students may be concurrently enrolled in the professional curriculum leading to the D.V.M. degree and in a graduate program leading to the M.S. or Ph.D. degree after completion of 90 undergraduate semester credits. The graduate program may be in the College of Veterinary Medicine or in another college.

Interested students must adhere to the following process:

- Complete a "Concurrent Enrollment for Graduate/Veterinary Medicine Degrees" form available on the web site at [www.grad-college.iastate.edu/common/forms/index.php](http://www.grad-college.iastate.edu/common/forms/index.php) (<http://www.grad-college.iastate.edu/common/forms/>). This is a combination application/concurrent form.
- Submit the "Concurrent Enrollment Request" form to the Graduate College after appropriate signatures are obtained.

Signed approvals on the concurrent form are required from the graduate program, the College of Veterinary Medicine, and the Graduate College. On admittance, the student receives an admission notification from the Office of Admissions. Consult Ch. 4.3.2 of the Graduate College Handbook.

## Concurrent Master's Degrees

By special request, students may complete two degree programs that lead to two concurrently awarded master's degrees by following these requirements:

- Complete and submit a "Two Concurrent Graduate Degrees (<https://iastate.box.com/s/h1k4448srpzvf052xl35bfnkwfy8xqrs/>)" form to the Graduate College,
- File separate Program of Study Committee (POSC) forms for each degree,
- File separate "Application for Graduation" forms for each degree,
- Complete separate projects or theses for each degree, if applicable
- File separate "Final Oral Exam Request" forms for each degree, if applicable, and
- Pass separate final oral examinations (if applicable) and complete a separate "Graduate Student Approval Form" for each degree.

Two awarded master's degrees require at least 22 hours of non-overlapping graduate credit in each major. If the two degrees are thesis or non-thesis degrees, they require two terminal projects (theses or creative components, respectively). Coursework-only degrees do not require a final project. These two degrees do not have to be awarded during the same term, since requirements for each are completed separately.

## Master's Degrees

General requirements for all master's degrees are as follows:

### General Requirements

The Graduate College Handbook outlines the general requirements for completion of a graduate degree at ISU. Faculty in a major field have the responsibility for establishing educational objectives for their graduate program, including specific course requirements and research requirements appropriate to the master's programs in the major. These requirements may place additional responsibilities on the student, the

major professor, or the student's program of study (POS) committee beyond those listed in the Graduate College Handbook as deemed appropriate to the goals of the major program.

Faculty and graduate students are active participants in the academic programs of Iowa State University. As active participants, they have a collective impact on the success of those programs and of the university in fulfilling its mission. Each graduate program is encouraged to implement a mechanism for responding to feedback from graduate students as a valuable resource for continuing improvement.

## Appointment of the Student's Program of Study (POS) Committee

New graduate students at ISU may be assigned a temporary academic advisor by the major program in the first semester of the student's residence. This faculty member guides the student in selection of a field of study and in development of a graduate program of study until the major professor and POS committee are selected. After the POS committee has been selected, it guides and evaluates the student during the remainder of graduate study.

A thesis master's POS committee consists of at least three members of the graduate faculty. It must include two members, including the major professor, from the major or program. The committee must include member(s) from different fields of emphasis so as to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's master's research as a co-major professor if a member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for the direction of a program of study. A non-thesis master's degree needs a minimum of one committee member.

Programs may establish requirements for more than one member. For more information on duties and makeup of the committee as well as changes to the committee makeup, see Ch.6 (<https://www.grad-college.iastate.edu/handbook/chapter.php?id=6>) of the Graduate College Handbook.

**Program of Study.** The student and major professor develop the program of study with the consultation and approval of the POS committee. This agreement between the student and the Graduate College should be submitted as early as possible for approval. It is recommended that the committee be formed and the POS form submitted as early as the second semester of graduate study. In no case can the committee and program of study be formed later than the term before the final oral examination for master's students.

**Residency.** There is no on-campus residency requirement for the master's degree.

**Credits.** Unless otherwise noted, at least 30 credits of acceptable graduate work must be completed in all master's programs. At least 22 graduate credits must be earned from Iowa State University.

**Transfer Credits.** At the discretion of the POS committee, and with the approval of the program and the Graduate College, graduate credits earned as a graduate student at another institution or through a distance education program offered by another institution may be transferred if the grade was B or better. Such courses must have been acceptable toward an advanced degree at that institution and must have been taught by individuals having graduate faculty status at the institution. If a student wishes to transfer credits from graduate courses taken at or through another university as an undergraduate student, it is the student's responsibility to provide verification by letter from that institution that these graduate courses were not used to satisfy undergraduate requirements for a degree.

A transcript must accompany the POS in order to transfer credits. The POS committee may ask for other materials, such as a course outline or accreditation of the institution, to evaluate the course. Transfer courses not completed when the POS is submitted must be completed the term before the student graduates. A transcript must then be submitted for review and final approval.

Research credits earned at another institution are generally not transferred. In rare circumstances, the transfer of S or P marks may be accepted for research credits only. It is the responsibility of the POS committee to obtain a letter from the responsible faculty member at the other institution stating that research credits recommended for transfer with S or P marks are considered to be worthy of a B grade or better. Audits may be listed on the program of study, but do not carry credit.

**Major.** A major is an approved area of study leading to a graduate degree. The exact number of credits in a major is not prescribed.

**Minor.** Minors are available in many disciplinary and interdepartmental graduate programs. Some programs offer only a minor. In other programs, students may declare either a major or a minor. Programs offering a major are not required to offer a minor. A student may not major and minor in the same discipline for a single degree or across multiple degrees. To illustrate, a student earning a Ph.D. in computer science may not minor in statistics for their Ph.D. program if they are also pursuing an M.S. in statistics.

The minor subject area must be tested at the final oral examination and cannot be placed on the transcript after graduation unless it was approved on the program of study, listed on all examination reports, and recorded on the Graduate Student Approval Form. A minor cannot be added to a degree that has already been received.

## Specific Master's Degrees

The number of credits in a major for a master's degree will vary according to various degrees. General credit requirements for all master's degrees include: a minimum of 30 graduate credits is required for all master's programs at ISU; at least 22 graduate credits must be earned at ISU; any transfer of graduate credits from another institution must be recommended in the program of study by the POS committee; and graduate credit earned as a graduate student will be approved for transfer only if a B grade or better was earned. A transcript must accompany the POS form. A complete listing of specific master's degrees can be found in Appendix D (<https://www.grad-college.iastate.edu/handbook/appendix.php?id=D>) of the Graduate College Handbook. A complete listing of all master's degrees can also be found online, <http://www.grad-college.iastate.edu/academics/gradprograms/index.php>. (<http://www.grad-college.iastate.edu/academics/gradprograms/>)

## Master's Double Degree Programs

A double degree requires fulfillment of the requirements for two graduate majors for which two differently named master's degrees and two diplomas are granted at the same time. For double degrees with a thesis or creative component, the final project (thesis or creative component) must integrate subject area from both majors.

The requirements for all students who are interested in pursuing double degree programs are listed below:

- The interested student must obtain the "Double Graduate Degree Request ([https://www.grad-college.iastate.edu/documents/forms/Double\\_Graduate\\_Degree\\_Request.pdf](https://www.grad-college.iastate.edu/documents/forms/Double_Graduate_Degree_Request.pdf))" form and submit it to the Graduate College for approval.
- Only **one** "Double Graduate Degree Committee Appointment ([https://www.grad-college.iastate.edu/documents/forms/Double\\_Degree\\_Committee\\_Appointment.pdf](https://www.grad-college.iastate.edu/documents/forms/Double_Degree_Committee_Appointment.pdf))" form and **one** "Double Graduate Degree Program of Study ([https://www.grad-college.iastate.edu/documents/forms/Double\\_Degree\\_POS.pdf](https://www.grad-college.iastate.edu/documents/forms/Double_Degree_POS.pdf))" form need to be submitted for the two degrees.
- For double degrees involving a creative component, there must be at least two graduate faculty members on the double degree POS committee. For double degrees involving a thesis, there must be at least three graduate faculty members on the double degree POS committee. Such POS committees for double degrees must include co-major professors from each of the majors.
- Although specific degree programs may require more, the program of study must include at least 48 hours of non-overlapping graduate credit (24 for each major) in the two degrees, and no less than 75% of the sum of the credits from each separate degree.
- If one or both of the degrees has a thesis or creative component, one final oral examination must be held covering the combined

thesis or creative component. One thesis is submitted to satisfy the requirements of both degrees.

- If a thesis or non-thesis is combined with a coursework only degree, the thesis/non-thesis project should include information for both degrees.
- **One** "Graduate Student Approval Form (<https://secure.grad-college.iastate.edu/graduate-approval/exam/>)" signed by the DOGE from both programs needs to be submitted to the Graduate College.
- All forms should clearly indicate that the student is enrolled in a double degree program.

## Drake University Law School/Iowa State University Combined Degree

To provide training in the complementary fields of law and political science with a minimum amount of academic duplication, special arrangements for a combined degree program have been approved with the Drake University Law School. ISU and Drake offer a combined J.D./M.A. in political science. Drake Law School students are permitted to transfer the equivalent of nine semester credits of specified law courses to ISU for credit for the political science program. Because of the difference in grading systems, the Law School grades are transferred as passes, provided the student has achieved a grade of C or better in those courses at Drake. Applicants for the combined program must meet the regular entrance requirements of, and be admitted to, both the Drake Law School and the ISU Graduate College.

## Doctor of Philosophy General Requirements

The degree doctor of philosophy is strongly research oriented. The primary requirements for the degree are:

- high attainment and proficiency of the candidate in their chosen field
- development of a dissertation which is a significant contribution to knowledge and which shows independent and creative thought and work
- successful passing of detailed examinations over the field of the candidate's major work, with a satisfactory showing of preparation in related courses. General requirements for Ph.D. candidates follow.

The Graduate College Handbook outlines the general requirements for completion of a Ph.D. degree at ISU. Faculty in a major field have the responsibility for establishing educational objectives for their graduate program, including specific course requirements and research requirements appropriate to the Ph.D. programs in the major. These requirements may place additional responsibilities on the student, the major professor, or the student's program of study (POS) committee beyond those listed in the Graduate College Handbook as deemed appropriate to the goals for the major program.



Faculty and graduate students are active participants in the academic programs of Iowa State University. As active participants, they have a collective impact on the success of those programs and of the university in fulfilling its mission. Each graduate program is encouraged to implement a mechanism for responding to feedback from graduate students as a valuable resource for continuing improvement.

## Appointment of the Student's Program of Study (POS) Committee

The POS committee for a doctoral program consists of at least five members of the graduate faculty. It must include at least three members, including the major professor, from within the student's major or program. The committee must include member(s) from different fields of emphasis so as to ensure diversity of perspectives. A term member of the graduate faculty may participate in the direction of a student's dissertation research as a co-major professor if a member of the graduate faculty serves as a co-major professor and jointly accepts responsibility for direction of the dissertation.

## Changes to POS committee

Recommendations for changes in the POS committee must have the approval of the student, major professor, DOGE, and all committee members involved in the change (committee members who are retired, resigned, or not employed at ISU do not have to sign) before seeking approval of the Graduate College. These changes must be approved by the Dean of the Graduate College before the preliminary or final oral examination is held. For more information on changes to the committee and to the Program of Study, see Ch. 6 of the Graduate College Handbook.

## Program of Study

The student and the major professor develop the program of study with the consultation and approval of the POS committee. Early selection of a major professor, appointment of a POS committee, and development of a program of study are very important. It is recommended that the committee be formed as early as the second semester of graduate study. In no case can the committee be formed later than the term before the preliminary oral examination.

## Credits

A minimum of 72 graduate credits must be earned for a Ph.D. degree. At least 36 graduate credits, including all dissertation research credits, must be earned at Iowa State University. There is no specific university requirement regarding the number of credits to be taken inside or outside the major/program.

## Transfer Credits

At the discretion of the POS committee, and with the approval of the program and the Graduate College, graduate credits earned as a graduate student at another institution or through a distance education program offered by another institution may be transferred if the grade was B or

better. Such courses must have been acceptable toward an advanced degree at that institution and must have been taught by individuals having graduate faculty status at that institution. If a student wishes to transfer credits from graduate courses taken at or through another university as an undergraduate student, it is that student's responsibility to provide verification by letter from that institution that those graduate courses were not taken to satisfy undergraduate requirements for a degree.

A transcript must accompany the POS in order to transfer credits. The POS committee may ask for other materials, such as a course outline or accreditation of the institution, to evaluate the course. Transfer courses not completed when the POS is submitted must be completed before the term in which the student graduates. A transcript must then be submitted for review and final approval.

Research credits earned at another institution are generally not transferred. In rare circumstances, the transfer of S or P marks may be accepted for research credits only. It is the responsibility of the POS committee to obtain a letter from the responsible faculty member at the other institution stating that research credits recommended for transfer with S or P marks are considered to be worthy of a B grade or better.

## Major

A major is the area of study or academic concentration in which a student chooses to qualify for the award of a graduate degree. Majors are listed on the Graduate College website here: <https://www.grad-college.iastate.edu/academics/programs/apprograms.php>. Opportunities also exist for majoring in more than one area of study (co-major programs).

## Minor

Students may request a minor in any program approved to grant a graduate degree so long as the graduate program offers a minor and in programs approved to offer only a minor. Requirements for declared minors are determined by the minor program and the faculty member representing the minor field on the student's POS committee. The minor subject area must be tested at the preliminary oral and final oral examinations. A minor cannot be added to a program of study after the preliminary oral examination has been taken, nor can a minor be placed on the transcript after graduation, unless it was approved on the program of study, listed on all examination reports, and recorded on the Graduate Student Approval form. A student may not minor and major in the same field. A minor cannot be added to a degree that has already been awarded.

## Time Limits

The Graduate College's time-to-degree limit for all graduate students, both master's and Ph.D., is seven years. **Graduate programs may establish more restrictive time-to-degree limits.** For example, at the



program's discretion, a student beginning a Ph.D. degree program at ISU with a master's degree could be expected to complete the program within three or four or five years, while a student beginning a Ph.D. degree program without the master's degree could be expected to complete the program within five or six or seven years. This is an option that would be enforced at the department level. Requests to extend the seven-year time limit will be considered in situations involving medical or other extenuating circumstances. Cases in which the student leaves ISU during their graduate career and later returns are dealt with individually by the POS committee and the Graduate College.

The inclusion in the program of study/committee (POSC) of coursework that is beyond the time limits ("expired" courses) must be justified in the Expired Course Petition found on the Graduate College student forms page. This petition must be submitted in conjunction with the POSC form.

## Preliminary Examination

The Graduate College requires a preliminary oral examination of Ph.D. degree students; most programs add a written portion to the preliminary oral examination. The Ph.D. degree preliminary oral examination rigorously tests a graduate student's knowledge of major, minor, and supporting subject areas as well as the student's ability to analyze, organize, and present subject matter relevant to the field. A "Request for Preliminary Examination" form must be submitted to the Graduate College by the major professor at least two weeks before the proposed date of the examination.

The following conditions should be met before the "Request for Preliminary Examination" form is submitted to the Graduate College:

- admitted to full admission status in a Ph.D. granting program,
- POSC approved no later than 3 months before the preliminary oral examination,
- English requirement met,
- not on probation,
- time limit not exceeded (see Chapter 4 (<https://www.grad-college.iastate.edu/handbook/chapter.php?id=4&search=preliminary%20oral%20exam&section=4.4#ttd>)),
- qualifying examination (if required by program) passed,
- registration for a minimum of one credit, or for Examination Only (GR ST 681B) if no course work is needed, during the term in which the preliminary oral examination is taken

A preliminary oral examination will not be scheduled for a student on academic probation. Upon successful completion of the preliminary oral examination, the student is admitted to candidacy for the Ph.D. degree. If the graduate student fails all or part of the preliminary oral examination, the committee provides two options: gives a not pass and allows the student to retake the examination after six months or gives a not pass and does not allow the student to retake the examination. Six months

must elapse between the first attempt and the next. The entire POS committee must be convened for the preliminary oral examination. The preliminary oral examination must be passed at least six months prior to the final oral examination. An exception to the rule is allowed if a request signed by the major professor(s) and the program's DOGE is approved by the Dean of the Graduate College.

## Dissertation

A doctoral dissertation must demonstrate conclusively the ability of the author to conceive, design, conduct, and interpret independent, original, and creative research. It must attempt to describe significant original contributions to the advancement of knowledge and must demonstrate the ability to organize, analyze, and interpret data. In most instances, a dissertation includes a statement of purpose, a review of pertinent literature, a presentation of methodology and results obtained, and a critical interpretation of conclusions in relation to the findings of others. When appropriate, it involves a defense of objectives, design, and analytical procedures. Dissertation research should be worthy of publication and should appear in appropriate professional journals or in book form.

Responsibility for writing and editing of the dissertation rests with the student, under the supervision of the major professor, and not with the Graduate College. The Graduate College does not permit joint authorship of dissertations. It is the responsibility of the major professor to supervise the preparation of preliminary and final drafts of the dissertation, so as to assure the highest level of quality when the student presents the dissertation to the committee for final approval. Copies of the dissertation must be submitted to the POS committee at least two weeks before the final oral examination.

All theses and dissertations will be submitted electronically after the final oral examination is held. Please refer to the Graduate College Dissertation/Thesis website (<http://www.grad-college.iastate.edu/current/thesis/>) for requirements, fees, and other pertinent information.

Shortly after the submission of the "Application for Graduation" form, a one-time, nonrefundable thesis fee is billed by the university accounting system. In addition, a graduation fee will be assessed by the Registrar's Office. This fee is nonrefundable if a student does not cancel their graduation by the Graduate College's cancellation deadline.

## Final Oral Examination

The Ph.D. final oral examination, conducted after the dissertation is finished, is oral and often limited to a defense of the dissertation. To receive the degree at the end of a given semester, the student must hold the final oral examination before the final oral examination deadline for the semester.

The candidate is responsible for initiating the “Request for Final Oral Examination” form, which must be submitted to the Graduate College at least three weeks before the examination. The entire POS committee must be convened for the final oral examination. For more information on the final oral examination, see Ch. 7.1.2 of the Graduate College Handbook.

## Graduate Student Approval Form for Graduation

The Graduate College requires final approval from the student's program with submission of a “Graduate Student Approval Form (<https://secure.grad-college.iastate.edu/graduate-approval/exam/>)”, signed by the major professor(s) and the DOGE(s), including co-major DOGE if applicable, after the student has passed the final oral examination and completed any necessary changes on the dissertation/thesis requested by the committee. A paper dissertation/thesis signature page is not required.

- The form is electronically routed to the major professor or program to give to the student after the final oral exam request is received and approved by the Graduate College.
- The Graduate Student Approval Form must be completely routed and approved by the published deadline each term.
- After the Graduate Student Approval Form has been electronically signed, a dissertation/thesis student must upload their final dissertation/thesis to ProQuest. A non-thesis student must submit their creative component to the ISU Digital Repository.
- Once the signed Graduate Student Approval Form has been received by the Graduate College, a student's dissertation, thesis, or creative component will be reviewed for final approval.
- Final clearance of academic requirements will be made when current term grades have been submitted and evaluated by the Graduate College.

All incompletes from previous terms must be completed by the deadline for completion of the Graduate Student Approval Form. An incomplete, non-report, or failing grade that a student receives for the term of graduation will result in removal from that term's graduation list. The student will need to complete a new Application for Graduation and Graduate Student Approval Form for the new term of graduation.

If a conditional pass was recommended at the final oral examination, the major professor and the committee members, if so specified, must notify the Graduate College that the conditions have been met by submitting the Preliminary or Final Oral Exam Conditions Met Memo (<https://www.grad-college.iastate.edu/common/forms/files/Preliminary%20or%20Final%20Oral%20Exam%20Conditions%20Met%20Memo.pdf>) no later than the due date for the Graduate Student Approval Form for the term of graduation.

## Graduate Programs

The Graduate College Handbook outlines the general requirements for completion of a graduate degree or credential at ISU. Faculty in a major field have the responsibility for establishing educational objectives for their graduate program, including specific course requirements and research requirements appropriate to the doctoral, master's, and certificate programs in the major. These requirements may place additional responsibilities on the student, the major professor, or the student's program of study (POS) committee beyond those listed in the Graduate College Handbook as deemed appropriate to the goals of the major program.

Faculty and graduate students are active participants in the academic programs of Iowa State University. As active participants, they have a collective impact on the success of those programs and of the university in fulfilling its mission. Each graduate program is encouraged to implement a mechanism for responding to feedback from graduate students as a valuable resource for continuing improvement.

## Academic Program definitions

- **Program** - administrative infrastructure supporting the curriculum.
- **Curriculum** - the requirements for a major, certificate, or minor.
- **Major** - subject area of study that results in a named baccalaureate, master's, or doctoral degree upon completion of a set of requirements. A major appears on the academic transcript.
- **Certificate** - an academic credential in a focused area of study. A certificate appears on the academic transcript and may be earned concurrently with a degree or on its own.
- **Minor** - an academic area of emphasis that is in addition to a major. A minor appears on the academic transcript and must be earned in conjunction with a degree.

## Ph.D. Programs

A complete list of Ph.D. Programs can also be found on <https://www.grad-college.iastate.edu/academics/programs/apprograms.php>. (<https://www.grad-college.iastate.edu/academics/programs/apprograms.php>)

Aerospace Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=2>)

Agricultural and Biosystems Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=5>)

Agricultural Economics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=3>)

Agricultural Education (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=4>)

Agricultural Meteorology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=7>)

Analytical Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=9>)

Animal Breeding and Genetics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=10>)

Animal Physiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=11>)

Animal Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=12>)

Apparel, Merchandising, and Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=14>)

Applied Linguistics and Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=15>)

Applied Mathematics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=16>)

Applied Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=17>)

Astrophysics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=19>)

Biochemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=20>)

Bioinformatics and Computational Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=21>)

Biomedical Sciences (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=22>)

Biophysics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=23>)

Business and Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=26>)

Chemical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=27>)

Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=28>)

Civil Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=29>)

Computer Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=31>)

Computer Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=32>)

Condensed Matter Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=33>)

Crop Production and Physiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=35>)

Earth Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=37>)

Ecology and Evolutionary Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=38>)

Economics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=39>)

Education (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=40>)

Electrical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=41>)

Engineering Mechanics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=43>)

Entomology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=45>)

Environmental Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=46>)

Fisheries Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=49>)

Food Science and Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=50>)

Forestry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=51>)

Genetics and Genomics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=52>)

Geology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=53>)

Gerontology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=118>)

High Energy Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=55>)

Horticulture (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=58>)

Hospitality Management (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=59>)

Human Computer Interaction (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=60>)

Human Development and Family Studies (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=61>)

Immunobiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=62>)

Industrial and Agricultural Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=63>)

Industrial Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=65>)

Inorganic Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=68>)

Kinesiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=73>)

Materials Science and Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=75>)

Mathematics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=76>)

Meat Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=77>)

Mechanical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=78>)

Meteorology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=79>)

Microbiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=80>)

Molecular, Cellular and Developmental Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=81>)

Neuroscience (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=82>)

Nuclear Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=83>)

Nutritional Sciences (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=84>)

Organic Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=85>)

Physical Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=86>)

Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=87>)

Plant Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=88>)

Plant Breeding (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=89>)

Plant Pathology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=90>)

Population Sciences in Animal Health (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=141>)

Psychology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=93>)

Rhetoric and Professional Communication (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=96>)

Rural, Agricultural, Technological and Environmental History (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=139>)

Rural Sociology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=97>)

Sociology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=101>)

Soil Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=102>)

Statistics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=103>)

Sustainable Agriculture

Toxicology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=108>)

Veterinary Microbiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=112>)

Veterinary Pathology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=113>)

Wildlife Ecology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=115>)

Wind Energy Science, Engineering, and Policy (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=116>)

## Master's Programs

A complete list of Graduate level programs is available at <https://www.grad-college.iastate.edu/academics/programs/apprograms.php>.

Accounting (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=1>)

Aerospace Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=2>)

Agricultural and Biosystems Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=5>)

Agricultural Economics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=3>)

Agricultural Education (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=4>)

Agricultural Meteorology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=7>)

Agronomy (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=8>)

Analytical Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=9>)

Animal Breeding and Genetics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=10>)

Animal Physiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=11>)

Animal Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=12>)

Anthropology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=13>)

Apparel, Merchandising, and Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=14>)

Applied Mathematics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=16>)

Applied Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=17>)

Architecture (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=18>)

Artificial Intelligence (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=146>)

Astrophysics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=19>)

Athletic Training (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=145>)

Biochemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=20>)

Bioinformatics and Computational Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=21>)

Biomedical Sciences (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=22>)

Biophysics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=23>)

Business Administration (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=25>)

Business Analytics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=119>)

Chemical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=27>)

Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=28>)

Civil Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=29>)

Community and Regional Planning (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=30>)

Community Development (<https://www.agonline.iastate.edu/programs/community-development-ms/>)

Computer Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=31>)

Computer Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=32>)

Condensed Matter Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=33>)

Creative Writing and Environment (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=34>)

Crop Production and Physiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=35>)

Cyber Security (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=66>)

Diet and Exercise (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=36>)

Earth Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=37>)

Ecology and Evolutionary Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=38>)

Economics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=39>)

Education (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=40>)

Electrical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=41>)

Energy Systems Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=117>)

Engineering Management (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=42>)

Engineering Mechanics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=43>)

English (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=44>)

Entomology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=45>)

Entrepreneurship (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=152>)

Environmental Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=46>)

Event Management (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=144>)

Family and Consumer Sciences (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=47>)

Finance (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=48>)

Fisheries Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=49>)

Food Science and Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=50>)

Forestry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=51>)

Genetics and Genomics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=52>)

Geology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=53>)

Gerontology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=118>)

Graphic Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=54>)

Healthcare Analytics and Operations (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=149>)

High Energy Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=55>)

History (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=56>)

Horticulture (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=58>)

Hospitality Management (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=59>)

Human Computer Interaction (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=60>)

Human Development and Family Studies (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=61>)

Immunobiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=62>)



Industrial and Agricultural Technology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=63>)

Industrial Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=64>)

Industrial Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=65>)

Information Systems (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=67>)

Inorganic Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=68>)

Integrated Visual Arts (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=69>)

Interdisciplinary Graduate Studies (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=70>)

Interior Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=71>)

Journalism and Mass Communication (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=72>)

Kinesiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=73>)

Landscape Architecture (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=74>)

Materials Science and Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=75>)

Mathematics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=76>)

Mathematics Education (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=147>)

Meat Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=77>)

Mechanical Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=78>)

Meteorology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=79>)

Microbiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=80>)

Molecular, Cellular and Developmental Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=81>)

Neuroscience (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=82>)

Nuclear Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=83>)

Nutritional Sciences (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=84>)

Operations Research (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=120>)

Organic Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=85>)

Physical Chemistry (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=86>)

Physics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=87>)

Plant Biology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=88>)

Plant Breeding (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=89>)

Plant Pathology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=90>)

Political Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=91>)

Professional Practice in Dietetics (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=140>)

Psychology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=93>)

Real Estate Development (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=142>)

Rhetoric, Composition, and Professional Communication (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=95>)

Rural Sociology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=97>)

Science Education (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=99>)

Secondary Education (<https://www.grad-college.iastate.edu/academics/programs/apresults.php?id=148>)

Seed Technology and Business (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=100>)

Sociology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=101>)

Soil Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=102>)

Statistics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=103>)

Sustainable Agriculture

Sustainable Environments (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=105>)

Systems Engineering (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=106>)

Teaching English as a Second Language/Applied Linguistics (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=107>)

Toxicology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=108>)

Transportation (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=109>)



Urban Design (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=110>)

Veterinary Clinical Science (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=111>)

Veterinary Microbiology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=112>)

Veterinary Pathology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=113>)

Veterinary Preventive Medicine (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=114>)

Wildlife Ecology (<http://www.grad-college.iastate.edu/academics/programs/apresults.php?id=115>)

## Graduate Certificates

A complete list of Graduate level programs is available at <https://www.grad-college.iastate.edu/academics/programs/apprograms.php> (<https://www.grad-college.iastate.edu/academics/programs/apprograms.php>)

Advanced Manufacturing (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=1>)

Agronomy (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=50>)

Applied Research Methods in the Human Sciences (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=2>)

Biochemistry (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=52>)

Breeding for Organic Crops (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=64>)

Business Analytics (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=51>)

Community College Teaching (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=5>)

Computational Fluid Dynamics (being discontinued) (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=6>)

Computer Networking (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=7>)

Construction Management (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=8>)

Cyber Security (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=28>)

Data Driven Food, Energy, and Water Decision Making (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=63>)

Developmental and Family Sciences Advanced Research Design and Methods (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=9>)

Digital Marketplace Analytics (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=66>)

Early Childhood and Family Policy (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=67>)

Education and Outreach in Agriculture and Natural Resources (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=65>)

Education for Social Justice (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=40>)

Embedded Systems (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=13>)

Energy Systems Engineering (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=14>)

Enterprise Cyber Security Management (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=62>)

Entrepreneurship and Innovation (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=15>)

Environmental Engineering (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=16>)

Environmental Systems (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=17>)

Family Financial Planning (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=18>)

Family Well-Being in Diverse Society (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=19>)

Finance (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=61>)

Financial and Housing Counseling (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=20>)

Food Safety and Defense (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=21>)

Forensic Sciences (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=22>)

Geographic Information Systems (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=23>)

Gerontology (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=24>)

Graduate Student Teaching (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=25>)

Human Computer Interaction (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=26>)

Infant and Early Childhood Mental Health (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=27>)

Instructional Design (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=29>)

Lifespan Development (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=30>)

Literacy Coaching Certificate (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=31>)

Mathematics (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=60>)

Meat Science (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=59>)

Nondestructive Evaluation (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=55>)

Postsecondary Teaching (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=68>)

Power Systems Engineering (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=34>)

Preservation and Cultural Heritage (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=53>)

Public Management and Policy (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=36>)

Quantitative Psychology (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=37>)

Seed Business Management (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=38>)

Seed Science and Technology (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=39>)

Software Systems (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=41>)

Special Education (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=42>)

Superintendent Licensure (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=44>)

Supply Chain Management (<https://www.grad-college.iastate.edu/academics/programs/acresults.php?id=54>)

Systems Engineering (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=45>)

Teaching English as a Second Language/Teaching English as a Foreign Language (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=46>)

Veterinary Preventive Medicine (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=47>)

Youth Development Specialist (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=48>)

Youth Program Management and Evaluation (<http://www.grad-college.iastate.edu/academics/programs/acresults.php?id=49>)

## Graduate Minors

Minors are available in many disciplinary and interdepartmental graduate programs. Some programs offer only a minor. In other programs, students may declare either a major or a minor. Programs offering a major are not required to offer a minor. A student may not major and minor in the same discipline for a single degree or across multiple degrees. To illustrate, a student earning a Ph.D. in computer science may not minor in statistics for their Ph.D. program if they are also pursuing an MS in statistics.

## Graduate Minor Only Programs

The following programs are available as minor only. These minors do not have an associated graduate major.

Applied Scientific Computing (<http://asc.aere.iastate.edu/>)

Criminal Justice (<https://soc-cj.iastate.edu/>)

Linguistics (<https://apling.engl.iastate.edu/>)

Philosophy

Spanish (<http://catalog.iastate.edu/collegeofliberalartsandsciences/worldlanguagesandcultures/>)

Speech Communication (<http://www.engl.iastate.edu/graduate-students/>)

Women's and Gender Studies (<https://womensstudies.las.iastate.edu/graduate/>)

# COLLEGE OF VETERINARY MEDICINE

Dan Grooms, Dean of Veterinary Medicine

Jared A. Danielson, Senior Associate Dean for Academic and Student Programs Success and Innovation

[vetmed.iastate.edu/](http://vetmed.iastate.edu/) (<http://vetmed.iastate.edu/>)

## Departments of the College

- Biomedical Sciences
- Veterinary Clinical Sciences
- Veterinary Diagnostic and Production Animal Medicine
- Veterinary Microbiology and Preventive Medicine
- Veterinary Pathology

Other units of the college include the Lloyd Veterinary Medical Center, Veterinary Diagnostic Laboratory, Veterinary Medical Research Institute, CVM Information Technology and The Office of Curricular Assessment and Teaching Support. The college participates in interdisciplinary graduate programs in genetics; molecular, cellular and developmental biology; toxicology; immunobiology; and neuroscience.

## Objectives of the Curriculum

The instructional objective of the College of Veterinary Medicine is to enable students to assume vital roles in society as productive health care providers and biomedical scientists. Such an education provides students with general learning, communication, and problem solving abilities; veterinary medical practice and research skills; and professional and ethical values.

The curriculum incorporates basic biomedical and clinical principles, clinical decision making skills, and exceptional clinical experience in small animal medicine and surgery, equine medicine and surgery, food animal medicine and surgery, and production animal medicine. Companion animal medicine and surgery are provided within the regionally recognized referral hospital through the community practice unit and equine field services. The college is located in one of the most intensive livestock producing areas in the United States. Because of this, students have the opportunity to engage in extensive food supply veterinary medicine experiences and to experience numerous diagnostic cases.

The professional curriculum is a four-year course of study leading to the doctor of veterinary medicine degree. Each of the first three years of the curriculum consists of two semesters while the fourth year has three semesters. Students are admitted into the professional curriculum after

completing a minimum of 55 semester credits of required undergraduate coursework.

A strong and reputable basic science education during the first two years of the professional curriculum prepares veterinary students for a wide range of clinical experience during the last two years of the educational program. Fourth year students may choose to enhance their education by earning clinical elective credits at approved government agencies, research laboratories, veterinary practices and other university hospitals. Outstanding research programs in infectious diseases, food safety, neuroscience, immunoparasitology, evidence-based medicine, and many other areas provide opportunities for qualified students to participate in research.

Concurrent DVM/MS, DVM/PhD, DVM/MPH and DVM/MBA programs are available for qualified students who wish to obtain both veterinary and graduate degrees. Students must have a bachelor's degree or a minimum of 128 semester credits in undergraduate and professional curricula in order to participate in the concurrent DVM/graduate degree program. Admission to the concurrent degree program is subject to the approval of the deans of the College of Veterinary Medicine and the Graduate College.

The college is an important recruiting center for employers seeking veterinarians for private practice; industry; educational institutions; international agencies; federal, state and local governments; the armed forces; departments of public health; zoological gardens; and other related fields of professional activity. Graduates are highly sought after and typically have multiple employment offers upon graduation. Career services and an online job board are available for students.

## Pre-veterinary Medicine Preparation Admission Requirements

The College of Veterinary Medicine seeks students with diverse backgrounds and encourages students to enroll in baccalaureate programs in the college of their choice. A Bachelor's degree is not required for admission to the College of Veterinary Medicine. However, students must have a strong science foundation found in the required pre-veterinary coursework (<https://vetmed.iastate.edu/future-dvm-students/apply-to-the-college/pre-veterinary-requirements/course/>).

Veterinarians have varied career options. When deciding on an undergraduate major, the student should consider the area of veterinary medicine which interests them. For example, those who desire a career in clinical practice may wish to pursue a degree in biological science, animal science, agricultural economics, business, social science or humanities. Students with an interest in zoo or wildlife veterinary medicine may want to look at animal ecology, environmental studies or zoology. Future researchers may wish to consider genetics, molecular biology, microbiology, or biochemistry. Students who desire a career in public health (USDA, FDA, etc) or government (legislative/policy) may

find benefit in any of the biological sciences or in political science. A degree in education may be valuable to those who envision themselves as educators in a College of Veterinary Medicine. These examples are only suggestions and are but a few of the many possibilities.

For the most current information regarding application and admission to the College of Veterinary Medicine, please refer to the College web site at [www.vetmed.iastate.edu/](http://www.vetmed.iastate.edu/) (<http://www.vetmed.iastate.edu/>).

Applicants for admission to the College of Veterinary Medicine must have attended an accredited college or university and have completed 55 semester credits prior to the end of the spring term of the year in which they seek to be admitted to the College of Veterinary Medicine.

All science requirements should be fulfilled by the time of application or scheduled for completion by the end of the fall term in which the applicant applies. However, if necessary, the applicant may complete up to two required science courses after the fall term providing a transcript with the courses and grades listed is postmarked by July 1 of the year the applicant would enter. There is no maximum number of non-science required courses that may be completed but the deadline of having a transcript with these course grades posted by July 1 also applies. The July 1 deadline for transcripts and grades is firm.

Required courses must be completed with a grade of C (2.00) or better. A grade of C- (1.67) does not fulfill the requirement.

Credits earned must include the following Iowa State semester course offerings or their equivalents:

### English Composition 6 cr.

One year of composition or writing emphasis courses. May include business or technical writing. Two of the following courses would fulfill the requirement.

ENGL 150	Critical Thinking and Communication	3
ENGL 250	Written, Oral, Visual, and Electronic Composition	3
ENGL 302	Business Communication	3
ENGL 309	Proposal and Report Writing	3
ENGL 314	Technical Communication	3

### Oral Communications 3 cr.

May include public speaking, interpersonal communication, group or organizational communication or speaking emphasis courses. One of the courses below will fulfill the requirement.

SP CM 212	Fundamentals of Public Speaking	3
AGEDS 311	Presentation and Sales Strategies for Agricultural Audiences	3
SP CM 312	Business and Professional Speaking	3
COMST 214	Professional Communication	3

### General Chemistry with Laboratory\* 7 cr.

One year series for science majors with one semester lab.

CHEM 177 & 177L	General Chemistry I and Laboratory in General Chemistry I	5
CHEM 178	General Chemistry II	3
<b>Total Credits</b>		<b>8</b>

### Organic Chemistry with Laboratory\* 4 cr.

The first in a two-semester series of Organic Chemistry with lab. The second semester of organic chemistry will not fulfill this requirement.

CHEM 331	Organic Chemistry I	3
CHEM 331L	Laboratory in Organic Chemistry I	1
<b>Total Credits</b>		<b>4</b>

### Biochemistry\* 3 cr.

One semester (no lab required). One of the courses below will fulfill the requirement. Must be metabolic biochemistry and cannot be biochemistry of proteins and enzymes alone.

BBMB 301	Survey of Biochemistry	3
BBMB 316	Principles of Biochemistry	3
BBMB 404	Biochemistry I	3
BBMB 420	Mammalian Biochemistry	3

### General Physics with Laboratory\* 4 cr.

First semester of a two-semester series with lab. Must include mechanics, fluids, heat and thermodynamics, vibrations, waves and sound. The second semester of Physics will not fulfill this requirement.

PHYS 131	General Physics I	4
PHYS 131L	General Physics I Laboratory	1
PHYS 115	Physics for the Life Sciences	4
PHYS 115L	Laboratory in Physics for the Life Sciences	1
PHYS 231	Introduction to Classical Physics I	4
PHYS 231L	Introduction to Classical Physics I Laboratory	1

### General Biology with Laboratory\* 8 cr.

Two semester series with lab each semester. If a series is not available a course in organismal biology with lab and a course in cellular biology and lab will fulfill this requirement. In addition, a Bachelor's degree in Biology fulfills this requirement.

BIOL 211	Principles of Biology I	3
BIOL 211L	Principles of Biology Laboratory I	1
BIOL 212	Principles of Biology II	3
BIOL 212L	Principles of Biology Laboratory II	1
<b>Total Credits</b>		<b>8</b>

**Genetics \* 3 cr.**

Must include Mendelian and molecular genetics. A general genetics course is preferred, but animal breeding/livestock improvement courses will be accepted. One of the courses below will fulfill the requirement.

BIOL 313	Principles of Genetics	3
GEN 320	Genetics, Agriculture and Biotechnology	3
AN S 352	Genetic Improvement of Domestic Animals	3

**Mammalian Anatomy or Physiology\* 3 cr.**

Human anatomy or physiology will also fulfill this requirement (no lab required). Must be an overview of all organ systems. If you take an Anatomy and/or Physiology I course, you must also take the second course, Anatomy and/or Physiology II, in order to fulfill the requirement. One of the courses below will fulfill the requirement.

B M S 329	Anatomy and Physiology of Domestic Animals	3
B M S 447	Introduction to Human Gross Anatomy	4
B M S 538	Principles of Physiology	4
AN S 214	Domestic Animal Physiology	3
BIOL 155	Human Biology	3
BIOL 255	Fundamentals of Human Anatomy	3
BIOL 335	Principles of Human and Other Animal Physiology	3
BIOL 351	Comparative Chordate Anatomy	5

**Humanities or Social Sciences 6 cr.****Electives 8 cr.****Total Credits Required 60 cr.**

Courses above marked with an asterisk (\*) are the required science courses. The required science course GPA is calculated from these courses.

Credits in the previously specified courses will normally be earned on the traditional four-letter grading system with A as the highest grade and D as the lowest passing grade. All required courses must be completed with a grade of C (2.0) or better. It is generally expected that required courses have been completed within the past eight (8) years. AP or CLEP credits must be documented by original scores submitted to the College of Veterinary Medicine. CLEP credits may be accepted only for arts, humanities and social sciences. Credits in the preceding specified courses will not be accepted if earned under the pass-not pass grading system or similar options. Please see COVID-19 exceptions (<https://vetmed.iastate.edu/sites/default/files/COVID-19-ImpactStatementRevised-10-23-2020.pdf>).

**Application and Admission**

Applicants must apply using the Veterinary Medical College Application Service (VMCAS). The VMCAS application may be found online at the

VMCAS website (<https://www.aavmc.org/becoming-a-veterinarian/how-to-apply/>).

Those applying through VMCAS also need to complete the ISU Supplemental Application (<https://vetmed.iastate.edu/future-dvm-students/apply-to-the-college/application-requirements/supplemental-application/>) found at the College of Veterinary Medicine website. The deadline for filing the VMCAS and Supplemental Application is typically mid-September.

A list of courses in progress at the time of submission and/or scheduled for completion by the end of spring term should be entered in the VMCAS application. Undergraduate college credits must average at least 2.50 on a 4.00 marking system for the application to be eligible for review. The preceding scholastic requirements are minimum and do not assure admission even though these requirements have been fulfilled.

Admission to the College of Veterinary Medicine is on a competitive and selective basis. GPA, animal, veterinary, research and other employment experiences, essays, recommendations and personal development (leadership, citizenship, volunteerism, etc.) are given consideration in the selection of candidates.

Positions are available to applicants in several applicant pools, including Iowa residents, participants in the Professional Program in Veterinary Medicine with the University of Nebraska-Lincoln, participants in the contract with the State of North Dakota, participants in other institution-specific contracts, and all other applicants including non-Iowan US citizens and international applicants. Consideration for admission is given equally without regard to race, color, national origin, gender, religion, disability, or age, political beliefs, or marital or familial status.

For further information, please visit the College of Veterinary Medicine at <https://vetmed.iastate.edu/future-dvm-students> (<https://vetmed.iastate.edu/future-dvm-students/>).

**Curriculum in Veterinary Medicine  
Graduation Requirements**

To be awarded the degree doctor of veterinary medicine, candidates must have passed all required courses in the curriculum in veterinary medicine, earned a minimum 2.0 grade-point average in the veterinary medicine curriculum, and earned at least 4 elective credits during the VM1-3 years. Candidates must also have given a grand rounds presentation (V C S 495 Grand Rounds Presentations).

**Required Courses in the Professional Program**

B M S 330	Principles of Morphology I	6
B M S 331	Principles of Morphology II	4
B M S 333	Biomedical Sciences I	6
B M S 334	Biomedical Sciences II	6



B M S 335	Molecular and Cellular Basis of Disease	1
B M S 336	Veterinary Nutrition	2
B M S 337	Neuroanatomy	3
B M S 339	Clinical Foundations I	1
B M S 345	Case Study I	1
B M S 346	Case Study II	1
B M S 354	General Pharmacology	3
B M S 443	Pharmacology and Therapeutics	3
V C S 311	Veterinarian in Society I	R
V C S 313	Veterinarian in Society III	1
V C S 314	Veterinarian in Society IV	1
V C S 315	Veterinarian in Society V	1
V C S 339	Clinical Foundations I	1
V C S 385	Grand Rounds	R
V C S 391	Clinical Imaging	1
V C S 393	Principles of Surgery	3
V C S 394	Principles of Surgery Laboratory	1
V C S 395	Small Animal Surgery	2
V C S 398	Anesthesiology	2
V C S 399	Ophthalmology	1
V C S 436	Small Animal Internal Medicine	3
V C S 440	Introduction to Clinics	R
V C S 444	Small Animal Medicine	4
V C S 445	Equine Medicine	2
V C S 448	Diagnostic Imaging and Radiobiology	3
V C S 449	Junior Surgery Laboratory	3
VDPAM 312	Introduction to Animal Welfare	1
VDPAM 426	Veterinary Toxicology	3
VDPAM 445	Production Animal Clinical Medicine	3
VDPAM 450	Disturbances of Reproduction	4
V MPM 378	Case Study IV	2
V MPM 380	Veterinary Immunology	2
V MPM 386	Veterinary Microbiology	5
V MPM 387	Veterinary Virology	3
V MPM 388	Public Health and the Role of the Veterinary Profession	3
V MPM 437	Infectious Diseases and Preventive Medicine	3
V PTH 342	Anatomic Pathology I	3
V PTH 372	Anatomic Pathology II	4
V PTH 376	Veterinary Parasitology	4
V PTH 377	Case Study III	2

V PTH 409	Introduction to Veterinary Cytology and Laboratory Techniques	1
V PTH 425	Clinical Pathology	4

## Fourth Year

The fourth year of the veterinary medical curriculum is designed to be flexible yet provide a broad based clinical education involving all domestic species of animals. All students participate in rotations that are considered fundamental to any species orientation that the student might choose. In addition, students choose one of four options for additional study, including the Small Animal, Equine, Mixed Animal, or Food Animal Options. Students may obtain clinical elective credits by repeating on-campus rotations or participating in approved off-campus preceptorships at government, private or public agencies; other universities; or private veterinary practices.

The following rotations are required of all fourth year students in addition to the requirements of the track they choose. A complete listing of track-specific requirements can be found at: <http://vetmed.iastate.edu/>:

V C S 453	Small Animal Medicine I	2
V C S 455	Small Animal Soft Tissue Surgery	2
or V C S 456	Small Animal Orthopedic Surgery	
Must have one equine course as assigned by the schedule optimizer.		2
V C S 457	Equine Medicine	
or V C S 464	Equine Field Services	
or V C S 458	Equine Surgery	
V C S 460	Radiology	2
V C S 463	Primary Care	2
V C S 466	Anesthesiology	2
V C S 468	Intensive Care	4
V C S 495	Grand Rounds Presentations	R
VDPAM 477	Food Animal and Camelid Medicine and Surgery	2
V PTH 456	Necropsy Laboratory Practicum	2
& V PTH 457	and Clinical Pathology Laboratory Practicum (Taken together as one 2-week block)	

## Reinstatement

Any student who voluntarily withdraws from the College of Veterinary Medicine or who is dismissed from the College of Veterinary Medicine, after having successfully completed one or more semesters forfeits his/her standing and must make written application for reinstatement to this college a minimum of 60 days prior to the opening of the semester for which they seek to re-enter. Any student who voluntarily withdraws from the College of Veterinary Medicine prior to completion of one semester must re-apply for admission to the college in the general applicant pool.



# Biomedical Sciences

## Professional Program of Study

For professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine

## Biomedical Sciences

The Department of Biomedical Sciences provides a hands on educational experience in human and animal health sciences. Our courses include cadaver-based human and veterinary anatomy, histology, physiology, pharmacology and cell biology, emphasizing a One Health approach that recognizes the interconnection between human and animal health.

A solid foundation in anatomy, physiology, and pharmacology is necessary to understand both the mechanisms of disease processes in humans and animals as well as their treatment. Specimen-based study of anatomy and physiology prepares students with a background in the structural and functional activities of cells, tissues, organs, and body systems relevant to human and veterinary medicine.

An understanding of drug action is essential for rational drug therapy. Our general pharmacology courses provide students with a background in basic pharmacology to include pharmacodynamics, toxicology, and the clinical application of drugs. Special emphasis is placed on chemical agents and therapeutic practices specific to both human and veterinary medicine.

## Graduate Programs

The department offers Master of Science and Doctor of Philosophy degrees with a major in Biomedical Sciences and specializations in Anatomy, Physiology, Pharmacology, and Cell Biology. Up to 10 credits of dual-listed veterinary courses may be applied for major graduate credit.

The objective of the department is to prepare graduate students for successful careers in biomedical research and professional service. The department is part of interdepartmental programs in neuroscience, toxicology, and molecular, cellular, and developmental biology. The combined Ph.D./DVM program is an option offered by the department.

Departmental research facilities allow for training in experimental anatomy, pharmacology, and physiology. Graduate studies are supervised by faculty members recognized in their areas of expertise. Current areas of research include: Alzheimer’s disease, aquatic animal health, calcium and mineral homeostasis, diabetes mellitus, glia-neuron signaling, neurophysiology of pain, neurotoxicology, physiology and pharmacology of nematode ion-channels, Parkinson’s disease, pharmacology of schistosomiasis, pharmacology of salmonellosis, physiology and pharmacology of thalamic neurons, physiology of the retina, Spinal Muscular Atrophy, and study of neural stem cells.

# Pharmacology and Toxicology Minor

## Pharmacology and Toxicology - Undergraduate Minor

The interdisciplinary pharmacology and toxicology minor is intended to significantly increase the number of ISU graduates who can:

- Understand, use and define key terms and concepts related to pharmacology and toxicology;
- Apply concepts and standard practices in pharmacology and toxicology to solving practical problems relevant to these fields;
- Analyze scientific data in pharmacology and toxicology;
- Synthesize detailed and accurate descriptions of current knowledge on key topics in pharmacology and toxicology;
- Make informed decisions about current controversies in pharmacology and toxicology, using appropriate scientific methods and ethical reasoning.

The minor in Pharmacology and Toxicology may be earned by completing the following courses. All minors require at least 15 credits; 9 credits of the courses listed in the minor must not be used to meet any other department, college, or university requirement except the credit requirement for graduation. There are three required courses for all Pharmacology and Toxicology undergraduate minors: TOX 401, B M S 439, and one physiology course selected from B M S 329, B M S 438 or BIOL 335. The remaining credits are fulfilled by any of the electives listed below.

### Required Core Courses:

TOX 401	Principles of Toxicology	3
B M S 439	Principles of Pharmacology	4
Select one of the following:		3-4
B M S 329	Anatomy and Physiology of Domestic Animals	
B M S 438	Principles of Physiology	
BIOL 335	Principles of Human and Other Animal Physiology	
Total Credits		10-11

### Electives:

A B E 424A	Air Pollution: Air quality and effects of pollutants	1
A B E 451	Food and Bioprocess Engineering	3
BBMB 316	Principles of Biochemistry	3
BBMB 404	Biochemistry I	3
BBMB 405	Biochemistry II	3
BIOL 319	Analysis of Environmental Systems	3
BIOL 423	Developmental Biology	3
BIOL 434	Endocrinology	3
BIOL 436	Neurobiology	3

B M E 440	Biomedical Applications of Chemical Engineering	3
B M S 443	Pharmacology and Therapeutics	3
B M S 448	Principles of Human Gross Anatomy	4
CHEM 211 & 211L	Quantitative and Environmental Analysis and Quantitative and Environmental Analysis Laboratory	4
CHEM 231	Elementary Organic Chemistry	3
CHEM 331	Organic Chemistry I	3
ENSCI 486	Aquatic Ecology	3
ENT 450	Pesticides in the Environment	3
FS HN 264	Fundamentals of Nutritional Biochemistry	3
FS HN 442	Issues in Food and Society	2
FS HN 461	Medical Nutrition and Disease I	4
FS HN 464	Medical Nutrition and Disease II	4
FS HN 467	Molecular Basis of Nutrition in Disease Etiology and Health Promotion	3
FS HN 489	Issues in Food Safety	1
TOX 354	General Pharmacology	3
TOX 419	Foodborne Hazards	3
TOX 420	Food Microbiology	3
TOX 426	Veterinary Toxicology	3
TOX 490	Independent Study	1-2
TOX 499	Undergraduate Research	1-3

## Veterinary Clinical Sciences Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine, Curriculum.

The curriculum of veterinary clinical sciences explores the preventive health care, and diagnosis and treatment of diseases of companion and competitive athletic animals. Veterinary specialists lead didactic and laboratory based learning in the clinical sciences. Experiential based courses conducted through the Veterinary Medical Center during the fourth year provide the student an opportunity to participate in the application of clinical skills and knowledge.

## Graduate Study

The department offers work for the degree master of science with major in veterinary clinical science, and minor work for students majoring in other departments. Within the veterinary clinical sciences major, the student may specialize in veterinary medicine, surgery, or theriogenology. The D.V.M. degree or equivalent is prerequisite to a major graduate work.

Both thesis and nonthesis options are available and require the completion of a minimum of 30 graduate credits and a final examination.

World languages and cultures requirements may be established by the student's program of study committee.

### Courses primarily for professional curriculum students:

#### V C S 305: Shelter Medicine

Cr. 1. S.

*Prereq: Vet Med Classification*

An elective course designed to educate the veterinary student about issues of relevance to companion animal population and shelter medicine and welfare.

#### V C S 311: Veterinarian in Society I

Cr. R. F.

*Prereq: Vet Med Classification*

Introduction to the veterinary profession and the various career opportunities available.

#### V C S 313: Veterinarian in Society III

(1-1) Cr. 1. F.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. The course covers selected topics on moral and ethical issues affecting the practice of veterinary medicine. Offered on a satisfactory-fail basis only.

#### V C S 314: Veterinarian in Society IV

(1-0) Cr. 1. F.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. This course will focus on helping students develop their communication, leadership, team building and conflict resolution skills.

#### V C S 315: Veterinarian in Society V

(1-0) Cr. 1. S.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. This course will emphasize veterinary law. Offered on a satisfactory-fail basis only.

#### V C S 318: Advanced Small Animal Oncology

Cr. 1. S.

*Prereq: Vet Med 3 Classification; V C S 444*

Provide advanced instruction in medical oncology, radiation oncology, and surgical oncology. General learning objectives include demonstrating the ability to utilize information from the physical exam and historical findings to direct appropriate diagnostics and staging based on a specific cancer diagnosis. Offered on a satisfactory-fail basis only.

**V C S 339: Clinical Foundations I**

(Cross-listed with B M S). (0-2) Cr. 1. F.

*Prereq: First-year classification in veterinary medicine*

Canine physical examination; basic behavior, animal handling and restraint; medical record keeping.

**V C S 385: Grand Rounds**

Cr. R. Repeatable. F.S.

*Prereq: Vet Med Classification*

Seminars and case presentations on selected clinical subjects by fourth-year students of the College of Veterinary Medicine. Attendance is required for a passing grade. Offered on a satisfactory-fail basis only.

**V C S 391: Clinical Imaging**

(1-0) Cr. 1. F.

*Prereq: Vet Med Classification*

Evaluation of morphologic anatomy of the dog and cat utilizing clinical imaging methods - radiography, ultrasonography, computed tomography, magnetic resonance imaging and nuclear imaging. Emphasis will be placed on normal radiographic anatomy.

**V C S 393: Principles of Surgery**

(2-2) Cr. 3. F.

*Prereq: Vet Med Classification*

General principles of surgery of companion animals.

**V C S 394: Principles of Surgery Laboratory**

(0-3) Cr. 1. S.

*Prereq: Vet Med Classification*

General principles of surgery of companion animals.

**V C S 395: Small Animal Surgery**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

Small animal surgery.

**V C S 396: Fundamentals in Equine Practice**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

This elective course is an introduction and overview of the clinical aspects of common conditions in horses and related conditions, including pathogenesis, clinical manifestations, diagnosis, treatment and prognosis. It is not designed to teach the student how to perform specific procedures, but rather to improve knowledge base of students interested in equine or mixed animal practice. Class will include lecture, photos, video presentations, and other formats.

**V C S 398: Anesthesiology**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

Anesthetic equipment, agents and procedures, including pain management for core species.

**V C S 399: Ophthalmology**

(1-0) Cr. 1. S.

*Prereq: Vet Med Classification*

Principles and techniques of medical and surgical ophthalmology.

**V C S 402: Clinical Cardiology I**

(1-0) Cr. 1. F.

*Prereq: Vet Med 3 or 4 Classification*

Elective course in diagnosis and management of cardiac diseases. Emphasis on interpretation of electrocardiography.

**V C S 403: Clinical Cardiology II**

Cr. 1. S.

*Prereq: Vet Med 3 Classification*

Elective course in clinical cardiology. Emphasis on common congenital and acquired cardiac diseases of companion animals. Builds on foundation of basic clinical cardiac knowledge obtained in V C S 444; expands to cover additional diseases in greater depth (e.g. infective endocarditis, systemic and pulmonary hypertension, heartworm disease, feline arterial thromboembolism, bradyarrhythmias and cardiac pacing, congenital heart diseases and interventional correction). Offered on a satisfactory-fail basis only.

**V C S 404: Topics in Emergency and Critical Care**

Cr. 2. S.

*Prereq: Vet Med 3 Classification*

Introduction of common topics in emergency and critical care in companion animals. General learning goals for students in this course include developing the ability to utilize physical exam skills and historical findings to triage patients and assess stability.

**V C S 405: Pet Bird and Exotic Species Medicine**

(1-3) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

Elective course in management and diseases of pet birds and exotic species.

**V C S 406: Introduction to Captive Wild Animal Medicine**

Cr. 1. S.

*Prereq: Vet Med 3 Classification*

Topics covering the health and welfare of non-domestic animals in captivity. Regulations specific to exotic animal ownership and exhibition will be covered. Students will discuss diseases which affect multiple taxon groups, and learn about interface diseases. Specific topics regarding the veterinary care of exotic canids, felids, ungulates, primates, Old-World Camelids, exotic equids and avian species will be discussed. Laboratories will introduce remote-delivery and restraint devices, dangerous animal handling techniques (including venomous snake handling techniques), contraception for non-domestic animals, and extra-label use of medications and vaccines in non-domestic species.

**V C S 407: Feline Internal Medicine**

(1-0) Cr. 1. F.

*Prereq: Vet Med 3 Classification*

Elective course in feline internal medicine.

**V C S 409: Oncology**

Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in oncology.

**V C S 414: Companion Animal Nutrition**

(1-0) Cr. 1. S.

*Prereq: Vet Med 3 or 4 Classification*

Elective course in small animal and equine nutrition.

**V C S 415: Advanced Small Animal Dermatology**

(1-2) Cr. 2. F.S.

*Prereq: Vet Med 4 Classification*

Elective course in dermatology. Offered on a satisfactory-fail basis only.

**V C S 419: Preceptorship in Companion Animal/Equine Veterinary Medical Practice**

Cr. 2-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Vet Med 4 Classification*

Elective course in veterinary practice under the guidance of veterinarians in approved practice settings. Maximum of 6 credits in 2 credit increments. Instructor Permission needed if not a VM4 classification.

**V C S 420: Practicum**

Cr. R. Repeatable.

*Prereq: Vet Med 4 Classification*

External practical experiences in the fourth year curriculum for additional professional development of the veterinary student. Instructor Permission needed if not a WM4 classification. Offered on a satisfactory-fail basis only.

**V C S 423: Zoo Preceptorship**

Cr. 2-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: (V C S 405 or V C S 406); Permission of Instructor*

Elective course in veterinary practice under the guidance of trained zoo veterinarians in approved practice settings. Maximum of 12 credits.

**V C S 436: Small Animal Internal Medicine**

(3-0) Cr. 3. F.

*Prereq: Vet Med 3 Classification*

Clinical diagnosis and treatment of diseases of small animals.

**V C S 437: Small Animal Shelter Medicine**

(2-0) Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

A 2-week elective rotation at an animal shelter/humane society that works with the public to place pets in homes. This rotation will encompass population medicine (medicine, surgery, intake, adoption, behavior and temperament, neglect and cruelty) that animal shelters deal with on a daily basis. The selected animal shelter/humane society must have a veterinarian(s) on staff and be approved by the course coordinator. More than one VCS 437 may be taken upon approval of the course coordinator.

**V C S 440: Introduction to Clinics**

Cr. R. S.

*Prereq: Vet Med Classification*

Rotating assignments through multiple sections within the Veterinary Medical Center.

**V C S 441: Canine Rehabilitation**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in rehabilitation.

**V C S 443: Equine Lameness**

(1-2) Cr. 2. S.

*Prereq: Vet Med 2 or 3 Classification*

Orthopedic diseases of the equine.

**V C S 444: Small Animal Medicine**

(4-0) Cr. 4. F.S.

*Prereq: Vet Med Classification*

Clinical diagnosis and treatment of diseases of small animals.

**V C S 445: Equine Medicine**

(2-0) Cr. 2. F.

*Prereq: Vet Med Classification*

Clinical diagnosis and treatment of diseases of equine.

**V C S 446: Clinical Neurology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical rotation in neurology with an emphasis on neurolocalization, disease processes, use of diagnostics in medical and surgical neurology and treatment options. Exposure to neurosurgical techniques.

**V C S 447: Equine Veterinary Diagnostic Skills**

(3-0) Cr. 2. S.

*Prereq: Vet Med 4 Classification*

Hands on experience with equine veterinary diagnostic skills related to theriogenology, medicine, surgery, radiology, and ophthalmology. Preference to equine track student.

**V C S 448: Diagnostic Imaging and Radiobiology**

(2-2) Cr. 3. F.S.

*Prereq: Vet Med Classification*

Essentials of diagnostic image interpretation. Essentials of radiobiology, radiation therapy and protection from radiation.

**V C S 449: Junior Surgery Laboratory**

(1-6) Cr. 3. F.

Pre-laboratory presentations and laboratories introduce the student to anesthetic and surgical principles and techniques that can be applied to all animal species.

**V C S 449B: Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 3. F.

*Prereq: Vet Med Classification*

This laboratory introduces the student to anesthetic and surgical principles and techniques that can be applied to all animal species. Provides a broader range of surgical experiences throughout the laboratory.

**V C S 451: Advanced Junior Surgery Laboratory**

(1-6) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species.

**V C S 451B: Advanced Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 2. Repeatable. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species. Exposure to more advanced surgical techniques with most surgical principles.

**V C S 451C: Advanced Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species. A second repeat for students with a special interest in small animal surgery.

**V C S 452: Clinical Dermatology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Study of clinical dermatological problems via computer-aided instruction, case simulations, and/or lectures. Clinical management of cases presented to Veterinary Medical Center. Instructor Permission needed if not a VM4 classification.

**V C S 453: Small Animal Medicine I**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in small animal medicine.

**V C S 455: Small Animal Soft Tissue Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in soft tissue surgery.

**V C S 456: Small Animal Orthopedic Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in orthopedic surgery.

**V C S 457: Equine Medicine**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine medicine.

**V C S 458: Equine Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine surgery.

**V C S 459: Small Animal Overpopulation Medicine and Surgery**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459A: Small Animal Overpopulation Medicine and Surgery :Nebraska Humane Society, Omaha NE**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459C: Small Animal Overpopulation Medicine and Surgery: WaySide Waifs, Kansas City MO**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459D: Small Animal Overpopulation Medicine and Surgery: Boulder Humane Society, Boulder, CO**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459E: Small Animal Overpopulation Medicine and Surgery: ASPCA Spay/Neuter Alliance, Ashville, NC**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 460: Radiology**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Clinical assignment in veterinary radiology.

**V C S 463: Primary Care**

Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Vet Med 4 Classification*

Clinical experience in hospital based general practice.

**V C S 464: Equine Field Services**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine ambulatory practice.

**V C S 465: Farrier**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment on the principles and practices of normal and therapeutic horseshoeing and equine foot care.

**V C S 466: Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in small animal and large animal anesthesiology.

**V C S 468: Intensive Care**

Cr. 4. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment to provide supervision of hospital cases requiring intensive care and including emergency cases.

**V C S 469: Ophthalmology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in ophthalmology.

**V C S 475: Cardiology Rotation**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in cardiology.

**V C S 476: Veterinary Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology. Experience includes case work-up, management and recovery. Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.

**V C S 476E: Equine Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology. Experience includes case work-up, management and recovery. Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.



**V C S 476S: Small Animal Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology. Experience includes case work-up, management and recovery. Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.

**V C S 478: Intensive and Critical Care**

(2-0) Cr. 2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in intensive care.

**V C S 480: Veterinary Dentistry**

Cr. 1. F.

*Prereq: Vet Med 3 or 4 Classification*

All aspects of veterinary dentistry, prophylaxis, endodontics, and orthodontics. This course is an on-line course. Offered on a satisfactory-fail basis only.

**V C S 481: Advanced Equine Dentistry**

Cr. 2. S.

*Prereq: Vet Med 4 Classification*

Clinical rotation in equine dentistry with an emphasis on routine equine dental examinations, specialized equipment, and corrective procedures. Offered only offered for one 2-week rotation. Enrollment is limited.

**V C S 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Independent Study in veterinary medicine focusing on basic / translational research or learning issues. Enrollment in this course is not appropriate for clinical experiences in the Veterinary Medical Center or extramural experiences in clinical veterinary practice (i.e., preceptorships).

**V C S 492: Orientation for International Experience**

(2-0) Cr. 1. Repeatable. S.

*Prereq: Vet Med Classification*

8 weeks. Predeparture orientation for group study abroad. Cultural considerations for the study abroad experience and a conversational language introduction. Out of class work may be assigned.

**V C S 495: Grand Rounds Presentations**

Cr. R. S.

*Prereq: Vet Med 4 Classification*

Seminars and case presentations on selected subjects by fourth year students of the College of Veterinary Medicine. Completion of a seminar presentation is required for graduation. Offered on a satisfactory-fail basis only.

**V C S 496: International Experience**

Cr. 1-12. Repeatable.

*Prereq: Vet Med Classification*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**V C S 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590A: Special Topics: Medicine**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590B: Special Topics: Surgery**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590C: Special Topics: Theriogenology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590D: Special Topics: Radiology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590E: Special Topics: Anesthesiology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor***V C S 590F: Special Topics - Ophthalmology**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.

*Prereq: Permission of Instructor*

Special topics in Ophthalmology.

**V C S 596: International Preceptorship**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Admission to Graduate college*

International Preceptorships and Study Abroad Group programs. Provides opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**V C S 599: Creative Component**

Cr. arr.

*Prereq: Permission of Instructor*

**Courses for graduate students:****V C S 604: Seminar**

Cr. 1. Repeatable. F.S.

**V C S 640: Advanced Radiology**

(2-0) Cr. 2.

*Prereq: V C S 448*

Detailed principles of clinical radiology with particular reference to radiographic interpretation.

**V C S 676: Advanced Medicine**

(2-0) Cr. 2.

*Prereq: V C S 445*

Principles of general medicine. A study in depth of factors that contribute to the development of clinical signs as related to the pathogenesis of disease.

**V C S 677: Advanced Medicine**

(2-0) Cr. 2.

*Prereq: V C S 445*

An advanced study of metabolic diseases.

**V C S 699: Research**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699A: Research: Medicine**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699B: Research: Surgery**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699C: Research: Theriogenology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699E: Research: Anesthesiology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699F: Research: Ophthalmology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Graduate Level Research.

**V C S 699G: Research: Cardiology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Graduate Level Research.

## Veterinary Diagnostic and Production Animal Medicine

### Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine, Curriculum.

Courses in veterinary diagnostic and production animal medicine provide students with basic and advanced skills in diagnostics, reproduction, medicine, surgery, production, welfare, and health management of the major livestock species. Students in the fourth year of the curriculum in veterinary medicine may elect to take advanced courses in beef, dairy, swine, poultry or small ruminant production medicine. Elective courses may include preceptorships in private practices, at other veterinary schools, in research and disease control laboratories, or in related agribusinesses.

Production animal medicine emphasizes the integration of veterinary medicine with nutrition, genetics, economics, food safety, and other disciplines, enabling graduates to acquire and use a broad knowledge base to support the health and improve the production and efficiency of the food supply chain.

## Graduate Study in Veterinary Preventive Medicine

Veterinary Preventive Medicine is a multidisciplinary program focused on the study of health and disease in populations. The various disciplines represented in the program are unified by a common approach based on the application of epidemiological methods to problem solving in populations. Through their research and course work, students will learn to understand and apply a variety of disciplines, principles, and techniques to population health issues involving environmental, ecological, nutritional, genetic, infectious, or non-infectious diseases.

Graduate study in Veterinary Preventive Medicine will provide valuable skills and experience to persons interested in public health, food safety, emerging infectious diseases, zoo or wildlife health, and livestock health. A degree in Veterinary Preventive Medicine may be valuable for individuals considering a future in the biological or pharmaceutical industries, government regulatory agencies, public veterinary practice, international service agencies responsible for population health or progressive private practice.

Veterinary Preventive Medicine is an interdepartmental major administered by the Department of Veterinary Diagnostic and Production Animal Medicine (VDPAM) with participating faculty from colleges and departments across the University and collaborators from the National Animal Disease Center (USDA:ARS) and the National Veterinary Services Laboratories (USDA:APHIS) located in Ames, Iowa.

Both thesis and non-thesis options are available and require the completion of a minimum of 30 graduate credits for thesis and 36 graduate credits for non-thesis and a final examination.

**Program of Study: Master of Science in Veterinary Preventive Medicine (Thesis Option) 30 credits**

STAT 587	Statistical Methods for Research Workers	4
VDPAM 527	Applied Statistical Methods in Population Studies	3
VDPAM 528	Principles of Epidemiology and Population Health	3
VDPAM 529	Epidemiological Methods in Population Research	3
VDPAM 699	Research	arr†

Research or Electives to total at least 17 additional credits

† Arranged with instructor.

**Program of Study: Master of Science in Veterinary Preventive Medicine (Non-Thesis Option) 36 Credits**

STAT 587	Statistical Methods for Research Workers	4
VDPAM 527	Applied Statistical Methods in Population Studies	3
VDPAM 528	Principles of Epidemiology and Population Health	3
VDPAM 529	Epidemiological Methods in Population Research	3
VDPAM 590	Special Topics	3
One Additional STAT course from the following		3
STAT 571	Introduction to Experimental Design	
STAT 573	Introduction to Survey Sampling	
STAT 575	Introduction to Multivariate Data Analysis	
VDPAM 599	Creative Component	arr†

Creative Component and Electives to total 18 additional credits

† Arranged with instructor.

**Graduate Certificate in Veterinary Preventive Medicine**

Veterinary Diagnostic and Production Animal Medicine offers a graduate certificate for DVMs, concurrent DVM students and non-DVMs in allied animal industries in Veterinary Preventive Medicine.

Students in this program are able to select courses that focus in areas of animal welfare, diagnostics, food safety, evidence-based medicine, surgery, pathology, microbiology, epidemiology, public health, statistics and production medicine.

The purpose of the graduate certificate in Veterinary Preventive Medicine for industry professionals is to address the continued and advanced needs of animal health professionals. The certificate enables professionals to gain recognition for a skill set that includes epidemiology, risk assessment, production medicine and animal welfare. A graduate certificate may be used to increase knowledge in a new or emerging area of interest to the candidate. As such, it may be used to formally gain recognition for retraining to meet the needs of today's food production systems.

The graduate certificate for concurrent DVM students is designed to give additional skills to students planning on working with populations of animals. Using a combination of on-line and dual listed graduate level courses, the program is designed to enable DVM students to complete the certificate while studying for their DVM degree. Students enrolled in any US-based DVM program are able to complete a graduate certificate at ISU using a combination of on-line and transfer graduate level courses.

The graduate certificate is an additional qualification awarded by Iowa State University after successful completion of 15 graduate level credits. A graduate certificate is different from continuing education as the certificate includes an academic transcript from Iowa State University. Students complete the same courses graduate students do with the the same expectations for all assignments and exams.

The program is available as a strictly on-line (off campus) delivery method or as a combination of classroom-based and on-line course offerings providing maximum flexibility in scheduling.

**Program of Study: Graduate Certificate in Veterinary Preventive Medicine (15 credits)**

Certificate required core courses		7
STAT 587	Statistical Methods for Research Workers	
VDPAM 528	Principles of Epidemiology and Population Health	
Remaining 3 core credits can be selected from		3
VDPAM 527	Applied Statistical Methods in Population Studies	
VDPAM 529	Epidemiological Methods in Population Research	

VDPAM 570	Risk Assessment for Food, Agriculture and Veterinary Medicine	
5 elective credits from any approved ISU graduate course		5
<b>Total Credits</b>		<b>15</b>

**Courses primarily for professional curriculum students:**

**VDPAM 308: Spanish for Veterinarians**

(2-0) Cr. 2. S.

*Prereq: Classification in veterinary medicine and basic knowledge of Spanish*

This course is designed to meet the needs of veterinary students who will practice in an environment in which the use of Spanish for accurate client communication is essential which includes much of our food animal industry in the state of Iowa. This is not a traditional Spanish language course. To be successful, students taking the course should have a basic knowledge of Spanish pronunciation, grammar and syntax.

**VDPAM 309: Introduction to Production Animal Informatics**

(1-0) Cr. 1. S.

The fundamentals of how clinical, diagnostic, production and financial information is obtained and used by production animal operations will be presented. Students will acquire skills to create and use spreadsheets for manipulating and summarizing data. They will also acquire knowledge of where to find inexpensive and readily available resources with information on how to use spreadsheets and other software. Students will also have the opportunity to work with record keeping programs used by food animal operations.

**VDPAM 310: Introduction to Production Medicine**

Cr. 2. S.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

The role of the veterinarian in the management of animal health and production in populations including evaluation tools in dairy and beef cattle herds, beef feedlots and swine herds will be described. Provides veterinary students with a starting point to understand the principles and techniques that are the basis of food-animal population health diagnosis management programs. Course available on-line, attendance is not required.

**VDPAM 312: Introduction to Animal Welfare**

(1-0) Cr. 1. S.

*Prereq: First-year classification in veterinary medicine*

A continuation of the Veterinarian in Society series. The objective of this course is to develop knowledge of the fundamental principles of animal welfare, in terms of science, ethics and cultural components.

**VDPAM 340: Clinical Foundations**

(0-30) Cr. 1. S.

*Prereq: Vet Med classification*

One week, hands-on course at Iowa State University; introduction to food supply veterinary medicine covering overviews of major animal agriculture species (beef, dairy, swine, small ruminants, and camelid), production systems, behavior, welfare, handling and restraint, examination techniques, biosecurity, epidemiology and food safety. Students will visit farms owned by Iowa State University and private clients of Food Animal and Camelid Field Services to perform hands-on clinical skills. Attendance is mandatory. Biosecurity: All students must follow current college policies regarding animal contact following foreign travel. Additionally, no swine contact is allowed within 48 hours of the swine farm visit. Required equipment includes coveralls, rubber boots, thermometer and stethoscope.

**VDPAM 351: Bovine Embryo Transfer and Related Technology**

(2-0) Cr. 2. S.

*Prereq: Vet Med 2 or 3 classification*

This course will meet for two hours once each week of the Spring Semester. The first hour will be traditional lecture and the second hour will be a combination of student projects, labs and demonstrations of applied clinical procedures. Bovine embryo transfer and closely related topics such as: female reproductive physiology, estrus synchronization, semen sexing and reproductive disease will be emphasized. In addition, several class periods will be devoted to the use of ultrasound for diagnosis of reproductive and non-reproductive conditions.

**VDPAM 365: Animal Welfare Judging and Assessment**

Cr. 1. Repeatable. F.

Preparation for competition in the Intercollegiate Animal Welfare Judging Contest. Development of critical appraisal and oral communication skills in regard to animal welfare. Animal behavior, physiology, health and performance parameters, basic husbandry, housing and preventive care will be explored for select farmed, companion and exotic species. Optional field trips. Course is open to Vet Med, Undergraduate and Graduate students.

**VDPAM 402: Advanced Dairy Production Informatics**

(1-1) Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 309 or Permission of Instructor*

Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCData as well as other dairy management and information software.

**VDPAM 402A: Advanced Dairy Production Informatics: Lecture Series**  
(1-1) Cr. 2. S.

*Prereq: Vet Med classification*

Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart as well as other dairy management and information software.

**VDPAM 402B: Advanced Dairy Production Informatics: Experience I**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 402C: Advanced Dairy Production Informatics: Experience II**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A; VDPAM 402B*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 402D: Advanced Dairy Production Informatics: Experience III**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A; VDPAM 402B; VDPAM 402C*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 407: Evidence Based Clinical Decision Making**

(Dual-listed with VDPAM 507). (1-0) Cr. 1. S.

*Prereq: Permission of instructor*

Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

**VDPAM 408: Poultry Diseases**

(Dual-listed with VDPAM 508). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

**VDPAM 409: Veterinary Practice Management and Organization**  
(2-0) Cr. 2. F.

*Prereq: Vet Med classification*

An A to Z introduction to proven veterinary practice management methods and strategies. The student will follow a detailed hands-on workbook describing most of the processes and procedures of day to day veterinary practice. Class content will be delivered via online modules.

**VDPAM 414: Veterinary Practice Entrepreneurship**  
(Dual-listed with VDPAM 514). Cr. 2-3. S.

*Prereq: Vet Med classification or Graduate student*

Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

**VDPAM 416: Bovine Reproduction Evaluation Laboratory**

(0-4) Cr. 1. F.S.

*Prereq: Vet Med 3 classification*

Bovine rectal palpation techniques will be repetitively taught in 7 four-hour sessions. Students will also learn techniques of epidural anesthesia, artificial insemination, pregnancy staging and ultrasonic imaging. University-owned cattle will be used. Spring semester only offered one section. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 419: Advanced Swine Production Informatics**

(1-0) Cr. 1. F.

*Prereq: VDPAM 309 or permission of instructor*

Advanced coverage of concepts related to the collection, manipulation, analysis, and reporting of information used by swine production companies. A quick review of modern swine production and measures of productivity ensures students have a firm base for applying the informatics. This course introduces students to one of the most commonly used swine record-keeping systems in the industry and gives them access to actual production data with which to work. Students then learn how to generate and interpret regularly used reports and will use pivot tables and budgeting models in Excel®. The importance of data entry and validation and how to transform data into useful knowledge are then addressed. Fundamentals of financial information, cost-benefit analysis and using budgeting models to assess the economics of animal health interventions are then applied.

**VDPAM 420: Applied Production Animal Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine with emphasis on government, industry or veterinary practice settings. Requires 40 hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420A: Applied Production Animal Medicine Preceptorship: Food Animal Emphasis**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in mixed animal production medicine with a food animal emphasis in veterinary practice settings. Requires 40 hours of clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420B: Applied Production Animal Medicine Preceptorship: General Mixed Animal Practice**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine in general mixed animal veterinary practice settings. Requires forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420C: Applied Production Animal Medicine Preceptorship: Government Agency or Food Processing Company**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine with emphasis on government agency or food processing company in veterinary practice settings. Forty hours clinical experience per week. Assignments will be preceptorships with a governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420P: Applied Poultry Production Medicine Preceptorship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Fourth year classification in veterinary medicine required. VDPAM 408 and/or VDPAM 498 strongly recommended.*

Unique, highly relevant, hands-on veterinary experience for participating students Development of poultry-specific practice skill sets Documented experience that is highly valued by future poultry employers Enhanced cultural and professional awareness for participating students through interaction with active poultry practitioners Exposure to diverse poultry practice and production environments. Up to 6 credits to count for graduation.

**VDPAM 421: Great Plains Veterinary Educational Center**

Cr. 1. F.S.SS.

*Prereq: Vet Med 4 classification*

The Great Plains Veterinary Educational Center (GPVEC), located on the US Meat Animal Research Center (USMARC) near Clay Center, Nebraska offers one week clinical training in production animal medicine species. All sections will be held at GPVEC. Student must be able to provide own transportation to each site.

**VDPAM 421A: Great Plains Veterinary Educational Center: Calving**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Calving Elective provides an opportunity to expand knowledge and experience in all phases of calving management. The program is structured around normal calving operations at USMARC including emergency duties. Activities that take place during the Calving Elective including the diagnosis, treatment, and management of many commonly encountered conditions in the dam and calf, necropsies, and daily discussions. Participation in a caesarian section is not guaranteed. Student must be able to provide own transportation to each site.

**VDPAM 421B: Great Plains Veterinary Educational Center: Bull Breeding Soundness**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Bull Breeding Soundness Examination Elective involves training in all phases of the bull fertility examination as recommended by the Society for Theriogenology. Chuteside, hand-on experience is the primary training technique for this elective with informal discussions held during the performance of breeding soundness examinations on 350 or more bulls. Student must be able to provide own transportation to each site.



**VDPAM 421D: Great Plains Veterinary Educational Center: Feedlot Management**

Cr. 1. F.SS.

*Prereq: Vet Med 4 classification*

Evaluation of production techniques and production efficiency including ration and feeding management, health management program development and evaluation, environmental management, quality assurance and field necropsy techniques. Exposure to marketing and economic considerations in feed yard decision making. A strong emphasis on population medicine, trouble shooting and problem-solving skills in the beef industry, with exposure to harvest/food safety considerations. Discussions on pharmaceutical and feed additive usage and legal implications in food supply veterinary medicine. Student must be able to provide own transportation to each site.

**VDPAM 421E: Great Plains Veterinary Educational Center: Calf Weaning Management**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

This is a hands-on elective in which students participate in the weaning management at the USMARC. Students will be involved with processing, feeding, finding, and treating sick calves. Additionally, students will be introduced to developing weaning rations and managing feed delivery. Students will also learn how to develop vaccination and treatment protocols and each student will have as an objective the development of their own vaccination and treatment protocol template. As time allows, students will visit commercial feed yards and cover production management topics. Student must be able to provide own transportation to each site.

**VDPAM 421F: Great Plains Veterinary Educational Center: Pregnancy Examination**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

The Pregnancy Examination Elective involves rectal examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some palpation experience and are interested in honing their skills. Pregnancy Examination occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Student must be able to provide own transportation to each site.

**VDPAM 421J: Great Plains Veterinary Educational Center: Lambing**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Lambing Elective involves students working with the USMARC lambing crew and GPVEC faculty in observations, assistance with delivery when necessary, and routine lambing duties. Students will work with veterinary personnel in sheep necropsy and health surveillance. Self-study material will be provided covering topics such as pre-breeding and breeding, pregnancy diagnosis, pregnant ewe management, pre-lambing ewe/lambing management, feeder lamb health and nutrition management, and replacement ewe and ram management. Student must be able to provide own transportation to each site.

**VDPAM 421K: Great Plains Veterinary Educational Center: Equine Dentistry**

(20-20) Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Equine Dentistry Elective provides the opportunity for students to expand their knowledge and experience related to equine dentistry. The rotation consists of lectures on topics relevant to equine dental care and hands-on laboratories during which students practice routine dental care procedures on USMARC horses. Equine Dentistry will involve both lecture and lab time at about equal shares. Student must be able to provide own transportation to each site.

**VDPAM 421P: Great Plains Veterinary Educational Center: Bovine Surgery**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

The Bovine Surgery Elective is designed to give students interested in food animal surgery an opportunity to practice their surgical skills by performing penile translocations and epididymectomies on USMARC teaser bull candidates. Lectures specific to gomer bull surgery as well as other topics related to food animal surgery will be presented during this elective. Student must be able to provide own transportation to each site.

**VDPAM 421Q: Great Plains Veterinary Educational Center: Swine Husbandry**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This elective provides students the opportunity to gain hands-on experience related to the daily activities of an intensively managed confinement swine unit. Rotation participants will work closely with USMARC Swine Unit personnel as they complete their daily routines in the farrowing and breeding areas of the USMARC Swine Unit and will participate in piglet delivery, neonatal pig processing, artificial and natural breeding, necropsies, and other activities as they arise. Student must be able to provide own transportation to each site.

**VDPAM 421R: Great Plains Veterinary Educational Center: Lamb Weaning Management**

Cr. 1. SS.

*Prereq: Vet Med 4 classification*

This elective provides the opportunity for students to develop their skills in the area of health and nutritional management of sheep immediately before and after weaning. The rotation consists of lectures on pre- and post-weaning nutrition, clinical parasitology, and prevention and control of common ovine infectious diseases. Hands-on experience during the week will take place at the USMARC Sheep Unit and will consist of walk-through and hand-on examinations of recently weaned lambs, treatment of sick lambs, inspection of weaning pen environment, investigation of herd outbreaks, and post mortem examination of all sheep mortalities. Student must be able to provide own transportation to each site.

**VDPAM 421S: Great Plains Veterinary Educational Center: Ultrasound Pregnancy Examination**

Cr. 1. SS.

*Prereq: Vet Med 4 classification*

The Ultrasound Pregnancy Examination Elective involves transrectal ultrasonographic examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some ultrasound experience and are interested in honing their skills. This elective occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Didactic instruction may include several topics in cow herd health, nutrition, management and reproductive decision making. Student must be able to provide own transportation to each site.

**VDPAM 421T: Great Plains Veterinary Educational Center: Food Animal Clinical Care and Treatment (FACCT)**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This course is designed to achieve hands-on and critical thinking skills necessary to provide clinical care to cattle and sheep. Student needs will be met through structured discussions and accompanying the veterinarians in daily care of the animals at USMARC. Student must be able to provide own transportation to each site.

**VDPAM 421U: Great Plains Veterinary Educational Center: Necropsy and Diagnostic Investigations**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This course is designed to develop diagnostic and critical thinking skills necessary to investigate disease outbreaks in a herd health setting. Student needs will be met through daily necropsy procedures, in depth discussions of case examples, and thorough exposure to diagnostic tests and sampling procedures. Student must be able to provide own transportation to each site.

**VDPAM 422: Beef Cattle Calving**

Cr. 2. Repeatable. F.S.SS.

*Prereq: VDPAM 310; fourth year classification in veterinary medicine; permission of instructor*

This elective provides students opportunity to assist cow-calf operations with calving in Nebraska, South Dakota or other locations. These operations typically calve 300-1,000 head each spring. Calving experience is not required, but a good understanding of working around cattle is necessary. Students will be actively participating in the day to day, normal calving routine including detecting and sorting off "springers", calf "watch", detecting when intervention is needed and assisting delivery, caring for and monitoring newborns and dams for good health and early disease detection, tagging/processing new calves, treating calves needing intervention and performing other routine calving chores. Students need to provide their own transportation to the site and overnight stays at or near the production sites are required. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 424: Preceptorship in Diagnostic Pathology.**

Cr. 1-6. Repeatable. F.S.

*Prereq: VDPAM 455*

Advanced course in production animal medicine with emphasis on gross and diagnostic pathology. Forty hours clinical experience per week. Assignments will be preceptorships with a diagnostic laboratory, veterinary pathologist, governmental agency and/or production unit. Biosecurity policies require documentation of student's presence in the USA 5 days immediately prior to the start of class.

**VDPAM 426: Veterinary Toxicology**

(Dual-listed with VDPAM 526). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**VDPAM 428: Principles of Epidemiology and Population Health**

(Dual-listed with VDPAM 528). (Cross-listed with MICRO, V MPM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**VDPAM 436: Beef Records Analysis**

(0-30) Cr. 1. F.S.

*Prereq: Vet Med 1, 2, or 3 classification*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability. Each semester's content builds on the material from the previous semester. Enrolling in the class for multiple semesters will be encouraged.

**VDPAM 436A: Beef Records Analysis: Introduction**

(0-30) Cr. 1. Repeatable. F.

*Prereq: Vet Med 1, 2, or 3 classification*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to become Beef Quality Assurance (BQA) certified through the Iowa Beef Center.

**VDPAM 436B: Beef Records Analysis: Herd Management**

(0-30) Cr. 1. Repeatable. S.

*Prereq: Vet Med 1, 2, or 3 classification; and VDPAM 436A*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

**VDPAM 436C: Beef Records Analysis: Cow/Calf Preventive Medicine**

(0-30) Cr. 1. Repeatable. F.

*Prereq: Vet Med 2 or 3 classification; and VDPAM 436A and VDPAM 436B*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Emphasis will be on obtaining a better understanding of nutritional and reproductive management of cow herds. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

**VDPAM 436D: Beef Records Analysis: Feedlot Production Medicine**

(0-30) Cr. 1. Repeatable. S.

*Prereq: Second or third year classification in veterinary medicine, or special permission of instructor*

Lectures will emphasize current production and evaluation techniques for feedlot production and students will develop a standard treatment protocol book. Topics include respiratory disease, receiving programs, nutrition, cattle handling and environmental issues.

**VDPAM 445: Production Animal Clinical Medicine**

(3-0) Cr. 3. S.

*Prereq: Vet Med 3 classification*

Clinical diagnosis and treatment of diseases of swine, beef and dairy cattle, and small ruminants.

**VDPAM 450: Disturbances of Reproduction**

(4-0) Cr. 4. F.

*Prereq: Vet Med 3 classification*

General principles of normal reproductive functions in addition to environment, management and diseases causing disturbances in reproduction. Cattle, Swine, Equine, Small Ruminant, and Small Animal species will be covered.

**VDPAM 451: Clinical Embryo Transfer**

Cr. 2. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 351*

Elective clinical assignment in techniques of embryo transfer. Primary species studied will be bovine but equine and small ruminant embryo transfer will be covered during discussions. Enrollment is limited to four students per two week session. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 455: Diagnostic Laboratory Practicum**

Cr. 1. Repeatable. F.S.

*Prereq: Vet Med 4 classification and VDPAM 310*

Practical experience and training in necropsy, recognition of gross lesions, diagnostic sample collection and test selection for the diagnosis of infectious, toxic, nutritional and metabolic diseases through exposure to diagnostic cases submitted to the ISU Veterinary Diagnostic Laboratory. The VDL accepts cases from all species; however, this course predominantly consists of porcine and bovine cases.

**VDPAM 456: Veterinary Diagnostic Lab Methods & Applications**

(16-0) Cr. 1. F.

*Prereq: Vet Med 2 or 3 classification*

An introduction to diagnostic medicine including strengths and weaknesses of various testing technologies, how to choose appropriate tests and technologies, sampling strategies in diseased and non-diseased populations and interpretation and integration of results of tests to achieve an accurate diagnosis are discussed.

**VDPAM 463: Feedlot Production Medicine**

Cr. 1. S.

*Prereq: VDPAM 310: concurrent enrollment in VDPAM 421D.*

One-week VM4 elective focusing on Midwestern feedlot production.

Addresses feedlot production practices common to Iowa and surrounding states, including feeding cattle on concrete or under roofs. Activities include participation and visitation to representative feedlots in Iowa.

**VDPAM 465: Animal Welfare Clinical Rotation**

Cr. 2. F.SS.

*Prereq: Vet Med 4 classification*

Two-week course for senior veterinary students to gain skills for collecting and interpreting animal welfare data, aid clients with identifying and achieving welfare goals, and assisting law enforcement with animal cruelty response. Field trips to food animal and companion animal facilities are mandatory.

**VDPAM 471: Animal Reproduction**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in animal reproduction. Equine, Food Animal, Small Animal and Comparative reproduction only.

**VDPAM 471C: Animal Reproduction: Comparative**

Cr. 2. Repeatable, maximum of 4 credits. F.SS.

*Prereq: Vet Med 4 classification*

Elective comparative clinical assignment in Theriogenology with caseload management in Food Animal, Equine, Small Animal and Small Ruminants sections. Rotation through these different sections will depend on the caseload (by species) and include routine breeding management, semen collection and cryopreservation in different species, advanced laparoscopic and non-surgical procedures for insemination and embryo flushing/transfer, pregnancy diagnosis as well as management of reproductive emergencies.

**VDPAM 471E: Animal Reproduction: Equine Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in Equine Theriogenology involving both mare and stallion breeding management, cool-shipped semen preparation and semen cryopreservation, embryo transfer, foaling of high-risk pregnant mares as well as normal mares, breeding soundness exams of the mare and stallion, treatment of retained fetal membranes and neonatal care.

**VDPAM 471F: Animal Reproduction: Food Animal Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in Food Animal Theriogenology involving male and female breeding soundness exams, dystocia management, advanced diagnostic and surgical procedures, surgical and non-surgical insemination programs in small ruminants, and semen cryopreservation. Medical and surgical correction of reproductive disorders in cattle, swine and small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 471S: Animal Reproduction: Small Animal Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Vet Med 4 classification*

Primary reproductive management in the canine and feline involving breeding management of the bitch and stud dog, advanced surgical and non-surgical insemination using fresh, cooled or frozen semen, and infertility case management for the male and female. High risk pregnancy management, parturition and neonatal care of both canine and felines, as required.

**VDPAM 476: Food Animal and Camelid Field Service**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Students will assist university veterinarians in delivering individual animal health care and herd-based production management services to the ISU livestock farms and other livestock farms in the local area. Focus on the establishment of best practices for herd management of production systems at the university and in the region. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 477: Food Animal and Camelid Medicine and Surgery**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Clinical assignment focused on the management of food animal and camelid medicine and surgery cases. Specific instruction in clinical evaluation of cases coupled with appropriate diagnostic testing and therapeutic intervention will be emphasized. Additional instruction will be provided in disease prevention, intensive care and management of food animal and camelid species. Particular emphasis will be placed on appropriate on-label and extra-label drug usage in food animal species. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 478A: Swine Medicine Education Center: Swine Production Management and Consultation**

Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 310*

Swine production management and consulting skills within a progressive swine production and management system. Time will be split approximately with half in-class discussion topics of finance and business of the swine industry and half on-farm learning opportunities where students will visit a breeding farm, nursery facility, finishing facility, wean-to-finish facility, gilt developer unit, and a truck wash facility.

**VDPAM 478B: Swine Medicine Education Center: Swine Clinical Pharmacology and Treatment Management**

Cr. 2. Repeatable. S.SS.

*Prereq: VDPAM 310*

Basic and applied information on swine treatment options, strategies to maximize efficacy, and skills to pursue judicious use of antimicrobials, reproductive interventions, and the entire spectrum of drug therapies. The course emphasizes case based application and decisions and is approximately 30% web-based and 70% on-site including farms of a variety of structures and functions. During the course, students prepare a thorough evaluation of the pharmacologic interventions that may occur on farms and then implement this evaluation in active production facilities to maximize efficacy, compliance and animal welfare as part of a comprehensive judicious use objective.

**VDPAM 478C: Swine Medicine Education Center: Swine Emerging Diseases and Emergency Response Management**

Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 310 VDPAM 480*

Diagnostic tests, methods, approaches, analysis, and evaluation of emerging swine diseases and provide general knowledge of disease elimination and methods to manage herd losses and economic losses due to disease. Two-week, on-site module that combines structured site visits and classroom activities.

**VDPAM 479: Applied Swine Production Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Preceptorship course in swine production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 480: Swine Production Medicine**

(15-25) Cr. 2. Repeatable. F.S.SS.

*Prereq: VDPAM 310; Fourth year classification in Veterinary Medicine or permission of instructor*

Two week clinical rotation in swine production medicine. Students will be assigned to take the lead in investigating field based client cases with supervision of the instructors. Development of critical thinking skills that will allow students to apply concepts of herd management, production analysis, economic analysis, and disease prevention in addressing client cases. Variable amounts of travel to farm sites will be required with the potential for rare overnight stays. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 481: Advanced Cow/Calf Production Medicine**

(Dual-listed with VDPAM 581). (20-20) Cr. 2. S.

*Prereq: Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine*

Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 482: Applied Beef Production Medicine Preceptorship**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Advanced course in beef production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 483: Beef Production Medicine**

(15-20) Cr. 2. F.

*Prereq: Vet Med 4 classification and VDPAM 310*

Two week advanced clinical rotation in beef production medicine. Fifteen hours recitation/discussion and 20 hours clinical experience per week. This course is designed to expose students to cow-calf and feedlot production concepts. The activities scheduled for the rotation depend greatly on the time of year. Whenever possible, the class incorporates field trips to better understand how commercial cow/calf and feedlots operate and the veterinarian's role in their management. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.



**VDPAM 484: Dairy Production Medicine**

(15-20) Cr. 2. F.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Two week course in dairy production medicine combining class time with multiple on-farm visits to learn various management aspects (DHIA, DC305 & PC Dart record analysis, calf rearing through lactating cows, reproduction programs, udder health and milk quality, biosecurity, welfare, nutrition and cow comfort) for a wide variety of dairy operations. Students will learn the latest in dairy management by reviewing current topic articles and gain experience in farm evaluation through a group project. Fifteen hours recitation/discussion and 20 hours clinical experience per week. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 485: Applied Dairy Production Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Advanced course in dairy production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 486: Introduction to Small Ruminant Production Medicine**

(15-0) Cr. 1. S.

*Prereq: Vet Med 3 classification*

Survey of small ruminant production systems, common management practices, and disease processes of small ruminants and camelids. This course is intended to give the student a background in small ruminant medicine. Herd health, disease monitoring and prevention, nutrition, and typical management systems will be emphasized in lecture.

**VDPAM 487: Livestock Disease Prevention**

(3-0) Cr. 3. F.

The course is designed for both the pre-veterinary and animal science majors who have an interest in production animal health, disease prevention methods, epidemiology of economically important agents, and the ecology of currently important pathogens found in North American livestock industries. It will focus on disease prevention principles for individuals and large production population systems.

**VDPAM 488: Laboratory in Clinical Microbiology**

Cr. 1. Repeatable. F.S.

*Prereq: Vet Med 4 classification*

Application of microbiological procedures to the diagnosis of infectious diseases.

**VDPAM 489: Issues in Food Safety**

(Cross-listed with AN S, FS HN, HSP M). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**VDPAM 490: Independent Study**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of department chair***VDPAM 491: Advanced Ruminant Nutrition**

(30-10) Cr. 2. F.

Focus on dairy nutrition and balancing rations from the calf to the adult, lactating cow. Introduction to different feedstuffs and forage varieties to determine those that are best suited to bovine diets. This course starts the week immediately prior to the start of the fall semester and continues throughout the fall semester. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 494: Advanced Dairy Production Medicine**

(20-20) Cr. 2. S.

*Prereq: VDPAM 484 or permission of instructor*

Advanced course in investigating dairy herd problems relating to milk quality or nutrition. Milk quality and nutrition troubleshooting will be taught through the combination of lecture and on-farm investigations. Students will combine lecture knowledge, data acquired from on-farm investigations and record analysis to generate management plans. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 495: Advanced Small Ruminant Production Medicine**

(15-20) Cr. 2. F.S.

*Prereq: Vet Med 4 classification, VDPAM 486*

Two week clinical rotation in small ruminant production medicine. Field trips (including overnight stays) will be incorporated when possible. Topics to be covered include small ruminant industries (milk, meat, and fiber), milk quality, nutrition, reproduction, and disease management of small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 496: International Experience**

(Dual-listed with VDPAM 596). Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Vet Med 2, 3, or 4 classification*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.



**VDPAM 498: Poultry Medicine**

Cr. 2. SS.

*Prereq: Vet Med 4 classification*

Two-week senior elective to introduce students into poultry production medicine in the Midwest. Students will participate in routine flock monitoring, biosecurity reviews, disease investigations involving outbreaks in commercial and backyard poultry operations, and have a basic understanding of the poultry industry and poultry diseases. Involves didactic lectures in the classroom, field trips to poultry farms, and necropsies.

**Courses primarily for graduate students, open to qualified undergraduates:**

**VDPAM 507: Evidence Based Clinical Decision Making**

(Dual-listed with VDPAM 407). (1-0) Cr. 1. S.

*Prereq: Permission of instructor*

Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

**VDPAM 508: Poultry Diseases**

(Dual-listed with VDPAM 408). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

**VDPAM 514: Veterinary Practice Entrepreneurship**

(Dual-listed with VDPAM 414). Cr. 2-3. S.

*Prereq: Vet Med classification or Graduate student*

Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

**VDPAM 526: Veterinary Toxicology**

(Dual-listed with VDPAM 426). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**VDPAM 527: Applied Statistical Methods in Population Studies**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 587*

ANOVA, Linear Regression, Model Selection, Mixed Models, ANCOVA, Repeated Measurement Analysis, MANOVA, Nonparametric Methods, Diagnostic Test Evaluation, ROC Curve Analysis, Generalized Linear Models, Logistic Regression, Survival Analysis, Cox Proportional Hazards Regression, Count Data Analyses. This course is available on campus and by distance.

**VDPAM 528: Principles of Epidemiology and Population Health**

(Dual-listed with VDPAM 428). (Cross-listed with V MPM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**VDPAM 529: Epidemiological Methods in Population Research**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 587; VDPAM 528*

Train students on selecting the proper statistical model to conduct statistical analysis in the context of epidemiological studies. Train students to report and interpret data collected from experimental (clinical trials), observational (cross-sectional, case-control, cohort) or field-based studies incorporating the information covered in previous epidemiology/biostatistics courses and this course, and how to communicate the findings with the end-users. Introduce other methods that can be used when analyzing epidemiological studies. This course is available on campus and by distance.

**VDPAM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EE0B, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**VDPAM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**VDPAM 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**VDPAM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**VDPAM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**VDPAM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**VDPAM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**VDPAM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**VDPAM 546: Clinical and Diagnostic Toxicology**

(Cross-listed with TOX). (0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: D.V.M. degree or VDPAM 526*

Advanced study of current problems and issues in veterinary toxicology.

Emphasis on problem solving and interpreting clinical cases while utilizing clinical, epidemiological, and laboratory resources. Course consists highly of clinical case based material.

**VDPAM 551: Advanced Veterinary Diagnostic Pathology**

(0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: VDPAM 455; VPTH 570; VPTH 571*

Laboratory diagnosis of animal diseases with emphasis on gross and microscopic lesion description. Caseload is focused heavily on infectious diseases of food animals.

**VDPAM 560: Ecology of Infectious Diseases**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Topics of applied ecology of infectious diseases. Specific objectives include: a) understanding dynamics of pathogen transmission within and between population; b) how to reduce risk of pathogen introduction in populations; c) how to early detect pathogens and classify herds according to disease status; d) how to quantify pathogen transmission and impact in animal populations; e) applying and measure the effect of interventions to manipulate disease transmission dynamics within and between populations. Develop skills to prevent, detect and/or significantly control/eliminate animal health issues from animal populations. Learn how to quantify health issues and estimate the value of interventions to influence and mitigate health problems.

**VDPAM 564: Animal Welfare Science and Research**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Animal welfare is increasingly a key component of societal decisions about animal use, sustainable development and human-animal relationships. Understanding animal welfare as a scientific discipline, with primary focus on veterinary, biomedical and animal science disciplines. Explore fundamental and applied approaches to animal welfare science, including experimental design, data analysis and interpretation of results. Topics selected will reflect student interests, and may include animal welfare assessment and assurance, animal cognition, pain assessment and mitigation, and animal models used in biomedical research.

**VDPAM 570: Risk Assessment for Food, Agriculture and Veterinary Medicine**

(Cross-listed with AGRON, TOX). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Statistics 300-level or higher.

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

**VDPAM 581: Advanced Cow/Calf Production Medicine**

(Dual-listed with VDPAM 481). (20-20) Cr. 2. S.

*Prereq:* Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine

Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* Permission of Instructor

Topics in medicine, surgery, theriogenology; beef, swine, dairy, or sheep production medicine.

**VDPAM 596: International Experience**

(Dual-listed with VDPAM 496). Cr. 1-12. Repeatable. F.S.SS.

*Prereq:* Vet Med 2, 3, or 4 classification

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**VDPAM 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* Enrollment in nonthesis master's degree program

**Courses for graduate students:****VDPAM 650: Swine Diagnostic Medicine**

Cr. 4. F.

*Prereq:* Permission of Instructor

A detailed study of swine diseases emphasizing the pathogenesis and diagnosis of swine respiratory, enteric, reproduction, metabolic, and septicemic diseases. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

**VDPAM 654: Comparative Antimicrobial Clinical Pharmacology**

Cr. 2. Alt. F., offered odd-numbered years.

*Prereq:* Graduate student, resident, or intern in College of Veterinary Medicine

Initial antimicrobial selection for infectious diseases of domestic animals. The antimicrobial drug groups will be examined, stressing pharmacokinetics, minimal inhibitory concentrations, and the use of these parameters to select appropriate compounds and dosages for maximum efficacy.

**VDPAM 655: Advanced Swine Production Medicine**

Cr. 4. Alt. S., offered odd-numbered years.

*Prereq:* Permission of Instructor

Detailed overview of applied techniques used in swine production medicine; production modeling and record analysis, facility design and management, analysis of competing intervention options, design and evaluation of therapeutic and vaccination strategies, quality control procedures and food safety. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

**VDPAM 699: Research**

Cr. arr. Repeatable.

## Veterinary Microbiology and Preventive Medicine

### Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine, Curriculum.

The Department of Veterinary Microbiology and Preventive Medicine provides instruction on pathogenic bacteria, fungi, and viruses and their interaction with host animal species. Principles and applications of infectious diseases, immunity to disease, diagnostic methods for infectious diseases, and vaccinology are covered. Principles and applications of epidemiology, public health, preventive veterinary medicine, regulatory veterinary medicine and food safety are also emphasized.

## Graduate Study

The department offers opportunities for the degree doctor of philosophy with a major in veterinary microbiology. A specialization in preventive medicine is an option for this degree. Graduates in the Veterinary Microbiology and Preventive Medicine programs have a broad understanding of the fundamental processes involved in infectious diseases, pathogenesis and immunology. They are able to effectively establish research programs, which involve complex biological systems and disease syndromes. They are also prepared to address microbial-based social, ethical and environmental problems. Graduates acquire effective written and oral communication skills which lead to successful research and teaching careers in the medical and veterinary sciences. The department also offers work towards the master of science with majors in veterinary microbiology or veterinary preventive medicine. A non-thesis master's option is available for majors in preventive medicine. Courses are open for students majoring in other graduate programs.

Prerequisite to graduate study is completion of coursework in general microbiology, biology, biochemistry, mathematical sciences, and physics. Candidates for the majors in veterinary microbiology should possess an undergraduate degree in biomedical science with emphasis in medical microbiology or the D.V.M. degree. Candidates for the major in preventive medicine should possess the D.V.M. degree.

The department also participates in the interdepartmental majors and programs in genetics, immunobiology, and MCDB (molecular, cellular, and developmental biology; see Index).

Each graduate student must demonstrate proficiency in English composition within two semesters in residence.

### Courses primarily for professional curriculum students:

#### **V MPM 330: Global Health Disparities**

(Cross-listed with GLOBE). (3-0) Cr. 3. S.

*Prereq: Junior classification*

Historical and contemporary factors contributing to disparities in health outcomes for persons disadvantaged by income, location, ethnicity, sexual orientation, and abilities. Analysis and evaluation of health promotional materials, such as campaigns, and community-based interventions focused on reducing global health disparities.

Meets U.S. Diversity Requirement

#### **V MPM 360: Global Health**

(Cross-listed with GLOBE, MICRO). (3-0) Cr. 3. F.

*Prereq: BIOL 211*

Explores human health across the world with particular emphasis on low- and lower-middle-income countries. Attention is given to the interconnectedness of health determinants, problems, and solutions found in global health, including the role of animals and the environment. Broad in scope, highlighting different cultures and the historical foundations of global health. Topics include colonialism, poverty, emerging diseases, climate change, biodiversity, one health, maternal and child health, HIV, malaria, urbanization, noncommunicable diseases and more. Current events will be a feature of all class meetings. Meets International Perspectives Requirement.

#### **V MPM 378: Case Study IV**

(2-0) Cr. 2. S.

*Prereq: Vet Med classification*

Case-based applied learning that relates to the basic science courses. Emphasis on early integration of basic and clinical science concepts.

#### **V MPM 380: Veterinary Immunology**

(2-0) Cr. 2. S.

*Prereq: Vet Med classification*

Structure and function of the immune system in animals.

#### **V MPM 386: Veterinary Microbiology**

(3-5) Cr. 5. F.

*Prereq: Vet Med classification*

Bacteria and fungi of veterinary importance with emphasis on mechanisms of disease production and laboratory diagnostic procedures.

#### **V MPM 387: Veterinary Virology**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Basic principles of animal virology. Pathogenesis of viral infections. The nature and ecology of viruses of veterinary and zoonotic importance.

#### **V MPM 388: Public Health and the Role of the Veterinary Profession**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Fundamental epidemiology, zoonotic diseases, occupational health, food safety, other public health topics.

**V MPM 390: Topics in Veterinary History**

(1-0) Cr. 1. F.S.

An overview of the history of veterinary medicine focused primarily on disease-specific events. A review of the historical aspects of the veterinary profession's accomplishments in the discovery of the etiological origins of disease and their subsequent control will provide students with insights that are applicable to understanding and solving today's animal and human health challenges.

**V MPM 428: Principles of Epidemiology and Population Health**

(Dual-listed with V MPM 528). (Cross-listed with MICRO, VDPAM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**V MPM 437: Infectious Diseases and Preventive Medicine**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Etiology, epidemiology, laboratory diagnosis, regulatory control and preventive medicine aspects of the infectious diseases of swine, sheep, goats, cattle, horses, poultry, and honeybees.

**V MPM 486: Laboratory in Public Health**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Discussions, lectures, exercises and field trips related to veterinary public health.

**V MPM 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Instructor***V MPM 491: CDC Epidemiology Elective Preceptorship**

Cr. 6. F.S.SS.

*Prereq: Permission of Instructor*

Introduction to preventive medicine, public health and the principles of applied epidemiology within the working atmosphere of the Centers for Disease Control and Prevention.

**V MPM 496: International Experience**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Vet Med classification*

International Preceptorships and Study Abroad group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**V MPM 501: Basic Principles of Microbiology**

Cr. 3. F.

*Prereq: Master of Science in Biomedical Sciences (one-year, non-thesis) or Permission of Instructor*

The general principles of bacteriology, immunology and virology will be discussed. The structure and function of bacteria and viruses, the mechanisms of pathogenesis, and the host response to infectious agents will be reviewed. Vaccines, their failures, and new developments in vaccine development will be explored.

**V MPM 502: Microbial Genetics and Genomics**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**V MPM 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, FS HN, MICRO). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**V MPM 520: Principles of Immunology**

(3-0) Cr. 3. F.

*Prereq: MICRO 310 or Permission of Instructor*

Nature of the immune system and its role in health and disease. Credit for either V MPM 520 or 575, but not both may be applied toward graduation.

**V MPM 525: Intestinal Microbiology**

(Cross-listed with MICRO). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

Overview of commensal microbiota in the health and well-being of vertebrates. Topics include diversity of intestinal structure, microbial diversity/function, innate immune development, community interactions and metabolic diseases associated with alterations of the intestinal microbiome.

**V MPM 528: Principles of Epidemiology and Population Health**

(Dual-listed with V MPM 428). (Cross-listed with VDPAM). (3-0) Cr. 3. S. Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**V MPM 536: Zoonoses and Environmental Health**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* (V MPM 386; V MPM 387; V MPM 388) or *Permission of Instructor*

Pathogenesis and control of zoonotic diseases. Factors influencing transmission and survival of pathogenic microorganisms in the environment.

**V MPM 540: Livestock Immunogenetics**

(Cross-listed with AN S, MICRO). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq:* AN S 561 or MICRO 575 or V MPM 520

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

**V MPM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**V MPM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**V MPM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**V MPM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**V MPM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**V MPM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**V MPM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**V MPM 575: Immunology**

(3-0) Cr. 3. S.

*Prereq:* MICRO 310

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**V MPM 586: Medical Bacteriology**

(Cross-listed with MICRO). (4-0) Cr. 4. F.

*Prereq:* *Permission of Instructor*

Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses. Concurrent students need to register for 586L.

**V MPM 586L: Medical Bacteriology Laboratory**

(0-6) Cr. 2. F.

*Prereq:* *Permission of Instructor*

Laboratory in clinical bacteriology and mycology. Credit or enrollment in V MPM 586 or V MPM 625.

**V MPM 587: Animal Virology**

(4-0) Cr. 4.

*Prereq:* *Permission of Instructor*

Principles of animal virology. Biology of viruses associated with diseases of veterinary importance, including mechanisms of pathogenesis.

**V MPM 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq:* *Permission of Instructor*



**V MPM 599: Creative Component**

Cr. arr.

*Prereq: Nonthesis M.S. Option only*

A written report based on laboratory research, library reading, or topics related to the student's area of specialization and approved by the student's advisory committee.

**Courses for graduate students:****V MPM 604: Seminar**

(1-0) Cr. 1. Repeatable. F.

Offered on a satisfactory-fail basis only.

**V MPM 608: Molecular Virology**

(Cross-listed with MICRO, PL P). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**V MPM 615: Molecular Immunology**

(Cross-listed with BBMB, MICRO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**V MPM 625: Mechanisms of Bacterial Pathogenesis**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Credit in BBMB and MICRO*

Review of current concepts in specific areas of microbial pathogenesis including the genetic basis for bacterial disease, genetic regulation and control of virulence factors and their mechanisms of action, and host-pathogen interactions at the cellular and molecular levels. The application of microbial genetics to understanding pathogenesis will be included.

**V MPM 629: Advanced Topics in Cellular Immunology**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: (V MPM 520 or V MPM 575) or Permission of Instructor*

Current topics and literature in cellular immunology. Topics include thymocyte development and selection, T cell interactions with antigen presenting cells, and lymphocyte effector functions.

**V MPM 660: Pathogenesis of Persistent Infections**

(Cross-listed with V PTH). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Permission of Instructor*

Study of current knowledge related to host pathogen interactions during persistent and chronic infections by bacteria, viruses and parasites.

**V MPM 690: Current Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 690A: Current Topics: Immunology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 690B: Current Topics: Infectious Diseases**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MCDB, MICRO). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**V MPM 699: Research**

Cr. arr. Repeatable.

## Veterinary Pathology

### Professional Program of Study

For the professional curriculum in veterinary medicine leading to the degree doctor of veterinary medicine, see Veterinary Medicine, Curriculum.

The Department of Veterinary Pathology offers a systematic study of basic disease mechanisms with emphasis on the changes in gene expression, cells, tissues, organs, and body fluids associated with disease. The theory and practice of veterinary pathology, veterinary clinical pathology, veterinary parasitology, veterinary toxicology, and related disciplines provide the basis for accurate diagnosis and a rational approach to the treatment and prevention of animal diseases.

## Graduate Study

The department offers work for the degree master of science and doctor of philosophy with a major in veterinary pathology. The majority of students choose an area of specialization in veterinary anatomic pathology, veterinary clinical pathology, or veterinary parasitology (<http://vetmed.iastate.edu/vpath/academics/graduate-program> (<http://vetmed.iastate.edu/vpath/academics/graduate-program/>)). The master

of science degree is available on a thesis or nonthesis basis in the veterinary pathology major with or without an area of specialization.

For the ACVP training track (residency) of the anatomic or clinical pathology graduate program designed to train veterinary pathologists, the student must have a funded position within the Department of Veterinary Pathology. If the student does not have a funded position or is not enrolled in the departmental degree program, enrollment in courses pertaining to the residency program and activities that support the residency program must have the approval of the Department Chair of Veterinary Pathology and the head of the departmental residency training program.

Graduates have a broad understanding of the mechanistic basis of disease pathogenesis. They are able to communicate with clinicians, other scientists, and other colleagues on scientific matters, and with the general public on related science policy matters. Graduates are able to address complex problems facing the agricultural and biomedical sciences, and comparative medicine, and are able to make appropriate diagnoses and investigations of animal diseases. They consider ethical, social, legal and environmental issues, and are skilled at carrying out research, communicating research results, and writing concise and competitive grant proposals.

Collaborative work is recommended in other departments in the College of Veterinary Medicine or departments or programs in other colleges. The department participates in the interdepartmental programs in Immunobiology ([www.immunobiology.iastate.edu/](http://www.immunobiology.iastate.edu/) (<http://www.immunobiology.iastate.edu/>)), Toxicology ([www.toxicology.iastate.edu/](http://www.toxicology.iastate.edu/) (<http://www.toxicology.iastate.edu/>)), Genetics ([www.genetics.iastate.edu/](http://www.genetics.iastate.edu/) (<http://www.genetics.iastate.edu/>)), and Molecular, Cellular, and Developmental Biology ([www.mcdb.iastate.edu/](http://www.mcdb.iastate.edu/) (<http://www.mcdb.iastate.edu/>)).

A veterinary degree (doctor of veterinary medicine or equivalent) is required for training in Veterinary Anatomic Pathology and Veterinary Clinical Pathology. Other specializations do not require the veterinary degree. A minimum score of 550 paper-based (213 computer-based; 79 internet based) is required on the TOEFL examination for students whose native language is not English. A foreign language requirement will be determined by the student's program of study committee with the approval of the departmental chair. The Graduate English Examination is a graduate college requirement for native English speakers.

The M.S. thesis degree in veterinary pathology, with or without an area of specialization, requires a minimum of 30 graduate credits. Following completion of all other requirements, a comprehensive final examination is administered covering all graduate work including the thesis. The examination is typically oral, but a written component may be specified by the program of study committee. The degree candidate must submit a thesis, including at least one manuscript suitable for publication, to the

committee members and departmental chair at least two weeks prior to the final examination. The departmental requirement for graduate courses includes:

3 credits of basic biological sciences (biochemistry, genetics, cell biology)		3
V PTH 551	Postmortem Pathology Laboratory	1
V PTH 570	Systemic Pathology I	4
or V PTH 571	Systemic Pathology II	
STAT 587	Statistical Methods for Research Workers	4
V PTH 605	Current Topics Seminar	1
V PTH 699	Research	arr t

**† Arranged with instructor.**

The M.S. nonthesis degree in veterinary pathology, with or without an area of specialization, requires a minimum of 40 graduate credits including at least 10 graduate credits earned outside the department. Every nonthesis master's degree program requires evidence of individual accomplishment demonstrated by completion of a creative component, special report, or scientific study. A minimum of 3 credits of such independent work (V PTH 599 Creative Component Research) and a practical diagnostic examination (V PTH 606 Diagnostic Interpretation) corresponding to the area of specialization are required on every program of study. The final examination is comprehensive and consists of written and oral questions. The departmental requirement for graduate courses includes those for the M.S. thesis degree plus additional courses corresponding to the area of degree emphasis of specialization. Contact the department for a more complete list of requirements and information on areas of specialization.

The Ph.D. degree in veterinary pathology, with or without an area of specialization, requires a minimum of 72 graduate credits including at least 12 graduate credits earned outside the department. The preliminary examination, consisting of written and oral components, is comprehensive and not restricted to the content of graduate courses. The degree candidate must submit a dissertation, including at least two manuscripts suitable for publication, to the committee members and departmental chair at least two weeks prior to the final examination. The final examination is primarily a defense of the dissertation, but it may include questions on other areas of specialized knowledge. The department also offers a combined DVM/Ph.D. program designed for completion of courses for the Ph.D. degree in Veterinary Pathology simultaneously with study in the professional curriculum in the College of Veterinary Medicine. Contact the department for a more complete list of requirements for the Ph.D. degree and information on areas of specialization.

**Courses primarily for professional curriculum students:****V PTH 342: Anatomic Pathology I**

(Dual-listed with V PTH 542). (2-2) Cr. 3. S.

*Prereq: First-year classification in veterinary medicine.*

Basic pathology with emphasis on disease in animals and introduction to disease by system.

**V PTH 353: Introductory Parasitology**

(Cross-listed with BIOL, MICRO). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**V PTH 372: Anatomic Pathology II**

(Dual-listed with V PTH 572). (3-3) Cr. 4. F.

*Prereq: V PTH 342*

Response to injury by each body system.

**V PTH 376: Veterinary Parasitology**

(Dual-listed with V PTH 576). (3-3) Cr. 4. F.

*Prereq: For V PTH 376, prereq: Second-year classification in veterinary medicine. For V PTH 576, prereq: Graduate classification and V PTH 542.*

Parasitic diseases of domestic animals and their control.

**V PTH 377: Case Study III**

(0-4) Cr. 2. F.

*Prereq: Second-year classification in veterinary medicine*

Clinical applications of the basic sciences taught concurrently in the fall semester of the second year curriculum in veterinary medicine.

**V PTH 401: Basics of Medical Terminology**

(1-0) Cr. 1. F.

Discussion of prefixes, suffixes, and roots (mostly from Latin and Greek) that comprise medical terms.

**V PTH 402: Introduction to Pathology**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Introductory exploration of pathology as a medical discipline. This includes study of disease mechanisms via an introduction to general pathology topics (cell degeneration, necrosis, disturbances of growth, disturbances of blood flow, inflammation, neoplasia) and organ system-specific response to injury.

**V PTH 409: Introduction to Veterinary Cytology and Laboratory Techniques**

(0-2) Cr. 1. S.

*Prereq: Third-year classification in veterinary medicine*

Description, interpretation, and techniques for cellular preparations from tissues and body fluids.

**V PTH 425: Clinical Pathology**

(2-4) Cr. 4. S.

*Prereq: V PTH 372*

Principles of clinical hematology, clinical chemistry, and urinalysis in domestic animals.

**V PTH 456: Necropsy Laboratory Practicum**

Cr. 1. Repeatable.

*Prereq: Vet Med 4 classification*

Practicum in postmortem examination and diagnosis.

**V PTH 457: Clinical Pathology Laboratory Practicum**

Cr. 1. Repeatable.

*Prereq: Vet Med 4 classification*

Methodology in clinical chemistry, hematology and cytology; practice in interpretation of laboratory data.

**V PTH 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor; Permission of Department Chair***V PTH 492: Orientation for International Experience**

(2-0) Cr. 1. Repeatable. S.

*Prereq: Vet Med classification*

8 weeks. Predeparture orientation for group study abroad. Cultural considerations for the study abroad experience and a conversational language introduction. Out of class work will be assigned. Offered on a satisfactory-fail basis only.

**V PTH 495: Clinical Competency Skills Checklist/Remediation**

Cr. R. S.

*Prereq: Vet Med 4 classification*

In order to graduate, all 4th year veterinary students are required to complete a checklist of clinical procedures and complete any assigned remediation (based on evaluation in core clinical rotations). These requirements are tied to the college's AVMA COE accreditation, and this course is used to document completion of those requirements. Offered on a satisfactory-fail basis only.

**V PTH 496: International Experience**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Second-year classification in veterinary medicine*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experience in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**V PTH 503: Principles of Pathology**

(3-0) Cr. 3. S.

*Prereq: Graduate classification; permission of instructor*

Introductory exploration of pathology as a medical discipline. This includes study of disease mechanisms via an introduction to general pathology topics (cell degeneration, necrosis, disturbances of growth, disturbances of blood flow, inflammation, neoplasia) and organ system-specific response to injury.

**V PTH 530: Teaching and Learning in Veterinary Medical Education**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Study of principles of teaching and learning as they relate to veterinary medical education. These include: theories of learning, analyzing content/learners/context, identifying goals, identifying appropriate instructional strategies (specific to medical education), matching assessment processes to goals and strategies, common curricular approaches and decision-making processes in medical education, and the scholarship of teaching and learning for veterinary medical educators.

**V PTH 542: Anatomic Pathology I**

(Dual-listed with V PTH 342). (2-2) Cr. 3. S.

*Prereq: First-year classification in veterinary medicine.*

Basic pathology with emphasis on disease in animals and introduction to disease by system.

**V PTH 548: Diagnostic Parasitology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 376 or V PTH 576*

Contact hours are (0-3 to 0-9). A laboratory experience in the technical and applied aspects of veterinary parasitology.

**V PTH 549: Clinical Pathology Laboratory**

(0-3) Cr. 1. Repeatable. F.S.SS.

*Prereq: V PTH 457; permission of instructor*

Laboratory procedures and clinical interpretations with emphasis on hematology, cytology, and clinical chemistry. Offered on a satisfactory-fail basis only.

**V PTH 550: Surgical Pathology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 570 or V PTH 571; permission of instructor*

Contact hours are (0-3 to 0-9). Diagnosis of lesions in biopsy specimens; classification of neoplasms. Course includes rotation through departmental biopsy service and review of selected cases from departmental archives. Offered on a satisfactory-fail basis only.

**V PTH 551: Postmortem Pathology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 542; permission of instructor*

Contact hours are (0-3 to 0-9). Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnosis. Offered on a satisfactory-fail basis only.

**V PTH 554: Ethics in Scientific Research and Writing**

(1-0) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Graduate classification*

Ethical conduct in biomedical research, criticism, writing, and adherence to regulations. Offered on a satisfactory-fail basis only.

**V PTH 570: Systemic Pathology I**

(4-0) Cr. 4. Alt. F., offered even-numbered years.

*Prereq: Graduate Classification; V PTH 372 or Permission of Instructor*

Pathology of the respiratory, reproductive, endocrine, musculoskeletal, and cardiovascular systems. Emphasis on pathogenesis and histopathology correlated with interpretive clinical pathology where appropriate. DVM degree required.

**V PTH 571: Systemic Pathology II**

(4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: Graduate Classification; V PTH 372 or Permission of Instructor*

Pathology of the integumentary, urinary, digestive, lymphoid, and nervous systems and special senses. Emphasis on pathogenesis and histopathology correlated with interpretive clinical pathology where appropriate. DVM degree required.

**V PTH 572: Anatomic Pathology II**

(Dual-listed with V PTH 372). (3-3) Cr. 4. F.

*Prereq: V PTH 342*

Response to injury by each body system.

**V PTH 576: Veterinary Parasitology**

(Dual-listed with V PTH 376). (3-3) Cr. 4. F.

*Prereq: For V PTH 376, prereq: Second-year classification in veterinary medicine. For V PTH 576, prereq: Graduate classification and V PTH 542.* Parasitic diseases of domestic animals and their control.

**V PTH 590: Special Topics**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor***V PTH 590A: Special Topics: Veterinary Pathology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor***V PTH 590B: Special Topics: Veterinary Parasitology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590C: Special Topics: Veterinary Toxicology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590D: Special Topics: Veterinary Clinical Pathology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590E: Special Topics: Other**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 596: International Preceptorship**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Admission to Graduate college*

International Preceptorships and Study Abroad Group programs.

This course will provide opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities. Offered on a satisfactory-fail basis only.

**V PTH 599: Creative Component Research**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599A: Creative Component Research: Veterinary Pathology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599B: Creative Component Research: Veterinary Parasitology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599C: Creative Component Research: Veterinary Toxicology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599D: Creative Component Research: Veterinary Clinical Pathology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**Courses for graduate students:**

**V PTH 604: Pathology Case Seminar**

Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Description and interpretation of microscopic lesions and clinical pathology data collected from cases of natural and experimental disease. Offered on a satisfactory-fail basis only.

**V PTH 605: Current Topics Seminar**

Cr. 1. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

A seminar of graduate research at the time of thesis or dissertation defense.

**V PTH 606: Diagnostic Interpretation**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606A: Diagnostic Interpretation: Veterinary Pathology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606B: Diagnostic Interpretation: Veterinary Parasitology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606C: Diagnostic Interpretation: Veterinary Toxicology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606D: Diagnostic Interpretation: Veterinary Clinical Pathology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 655: Cellular and Molecular Pathology I**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of cell injury, cellular responses to injury, and inflammation. Graduate course in biochemistry, genetics, or cell biology recommended.

**V PTH 656: Cellular and Molecular Pathology II**

(Cross-listed with TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of carcinogenesis.

**V PTH 660: Pathogenesis of Persistent Infections**

(Cross-listed with V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Permission of Instructor*

Study of current knowledge related to host pathogen interactions during persistent and chronic infections by bacteria, viruses and parasites.

**V PTH 661: Comparative Immunology and Infectious Disease**

(Cross-listed with IMBIO). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Graduate level Immunology or Permission of Instructor*

Discuss and define similarities and differences of varied host responses to infectious challenge. Learning will focus on comparative aspects of the host response and the unique aspects of immunity from different organisms, while highlighting molecular and mechanistic similarities of pathogen recognition, response and resolution.

**V PTH 679: Histopathology of Laboratory Animals**

(1-2) Cr. 2.

*Prereq: V PTH 570 or V PTH 571; Permission of Instructor*

Study of microscopic lesions in laboratory animals with emphasis on description, etiology, pathogenesis, and diagnosis.

**V PTH 699: Research**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699A: Research: Veterinary Pathology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699B: Research: Veterinary Parasitology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699C: Research: Veterinary Toxicology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699D: Research: Veterinary Clinical Pathology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.



# A-Z COURSES

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## A

- Accounting (ACCT)
- Actuarial Science (ACSCI)
- Advertising (ADVRT)
- Aerospace Engineering (AER E)
- African and African American Studies (AF AM)
- Agricultural and Biosystems Engineering (A B E)
- Agricultural Education and Studies (AGEDS)
- Agronomy (AGRON)
- Air Force Aerospace Studies (AFAS)
- American Indian Studies (AM IN)
- American Sign Language (ASL)
- Animal Ecology (A ECL)
- Animal Science (AN S)
- Anthropology (ANTHR)
- Apparel, Events, and Hospitality Management (AESHM)
- Apparel, Merchandising and Design (A M D)
- Arabic (ARABC)
- Architecture (ARCH)
- Art Education (ARTED)
- Art History (ART H)
- Astronomy and Astrophysics (ASTRO)
- Athletics (ATH)
- Athletic Training (A TR)
- A-Z Courses

## B

- Biochemistry, Biophysics, and Molecular Biology (BBMB)
- Bioinformatics and Computational Biology (BCB)
- Bioinformatics and Computational Biology (BCBIO)
- Biological/Pre-Medical Illustration (BPM I)
- Biology (BIOL)
- Biomedical Engineering (B M E)
- Biomedical Sciences (B M S)
- Business Administration (BUSAD)

## C

- Chemical Engineering (CH E)
- Chemistry (CHEM)
- Chinese (CHIN)
- Civil Engineering (C E)

- Classical Studies (CL ST)
- Communication Studies (COMST)
- Community and Regional Planning (C R P)
- Community Development (COMDV)
- Community Development GPIDEA (C DEV)
- Computer Engineering (CPR E)
- Computer Science (COM S)
- Construction Engineering (CON E)
- Criminal Justice (C J)
- Cyber Security (CYBSC)
- Cyber Security Engineering (CYB E)

## D

- Dance (DANCE)
- Data Science (DS)
- Design (DES)
- Design Studies (DSN S)
- Dietetics (DIET)

## E

- Early Childcare Education and Programming (E C P)
- Early Childhood and Family Policy (ECFP)
- Ecology and Evolutionary Biology (EEB)
- Ecology, Evolution, and Organismal Biology (EEOB)
- Economics (ECON)
- Educational Administration (EDADM)
- Educational Leadership and Policy Studies (EL PS)
- Education (EDUC)
- Electrical Engineering (E E)
- Engineering (ENGR)
- Engineering Mechanics (E M)
- English (ENGL)
- Entomology (ENT)
- Entrepreneurship (ENTSP)
- Environmental Engineering (ENV E)
- Environmental Science (ENSCI)
- Environmental Studies (ENV S)
- Event Management (EVENT)

## F

- Family and Consumer Sciences Education and Studies (FCEDS)
- Family Financial Planning (FFP)
- Finance (FIN)
- Food Science and Human Nutrition (FS HN)

- Forestry (FOR)
- French (FRNCH)

## G

- Genetics, Development and Cell Biology (GDCB)
- Genetics (GEN)
- Genetics (GENET)
- Geology (GEOL)
- German (GER)
- Gerontology (GERON)
- Global Resource Systems (GLOBE)
- Graduate Studies (GR ST)
- Graphic Design (ARTGR)

## H

- Healthcare Management (HCM)
- Health Studies (H S)
- Higher Education (HG ED)
- History (HIST)
- Honors (HON)
- Horticulture (HORT)
- Hospitality Management (HSP M)
- Human Computer Interaction (HCI)
- Human Development and Family Studies (HD FS)
- Human Sciences (H SCI)

## I

- Immunobiology (IMBIO)
- Industrial Design (IND D)
- Industrial Engineering (I E)
- Integrated Studio Arts (ARTIS)
- Interdisciplinary Graduate Studies (IGS)
- Interior Design (ARTID)
- International Studies (INTST)
- Iowa Lakeside Laboratory (IA LL)
- Italian (ITAL)

## J

- Journalism and Mass Communication (JL MC)

## K

- Kinesiology (KIN)

## L

- Landscape Architecture (L A)
- Latin (LATIN)
- Leadership Studies (LD ST)
- Learning and Leadership Sciences (L L S)
- Liberal Arts and Sciences Cross-Disciplinary Studies (LAS)
- Library (LIB)
- Linguistics (LING)

## M

- Management Information Systems (MIS)
- Management (MGMT)
- Marketing (MKT)
- Materials Engineering (MAT E)
- Materials Science and Engineering (M S E)
- Mathematics (MATH)
- Mechanical Engineering (M E)
- Meteorology (MTEOR)
- Microbiology (MICRO)
- Military Science (M S)
- Molecular, Cellular and Developmental Biology (MCDB)
- Music (MUSIC)

## N

- Natural Resource Ecology and Management (NREM)
- Naval Science (N S)
- Neuroscience (NEURO)
- Nursing (NRS)
- Nutritional Sciences (NUTRS)

## O

- Organization for Tropical Studies (OTS)

## P

- Performing Arts (PERF)
- Philosophy (PHIL)
- Physics (PHYS)
- Plant Biology (PLBIO)
- Plant Pathology (PL P)
- Political Science (POL S)
- Portuguese (PORT)
- Psychology (PSYCH)
- Public Relations (P R)

## R

- Religious Studies (RELIG)
- Research and Evaluation (RESEV)
- Russian (RUS)

## S

- Seed Technology and Business (STB)
- Sociology (SOC)
- Software Engineering (S E)
- Spanish (SPAN)
- Special Education (SP ED)
- Speech Communication (SP CM)
- Statistics (STAT)
- Supply Chain Management (SCM)
- Sustainable Agriculture (SUSAG)
- Sustainable Environments (SUS E)

## T

- Technology Systems Management (TSM)
- Theatre (THTRE)
- Toxicology (TOX)
- Transportation (TRANS)

## U

- University Studies (U ST)
- Urban Design (URB D)
- U.S. Latino/a Studies Program (US LS)

## V

- Veterinary Clinical Sciences (V C S)
- Veterinary Diagnostic and Production Animal Medicine (VDPAM)
- Veterinary Microbiology and Preventive Medicine (V MPM)
- Veterinary Pathology (V PTH)

## W

- Wind Energy Science, Engineering and Policy (WESEP)
- Women in Science and Engineering (WISE)
- Women's and Gender Studies (WGS)
- World Film Studies (W F S)
- World Languages and Cultures (WLC)

## Y

- Youth (YTH)

## Accounting (ACCT)

**Any experimental courses offered by ACCT can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

### ACCT 215: Legal Environment of Business

(3-0) Cr. 3. F.S.SS.

*Prereq: Sophomore classification*

General history, structure, and principles of the US legal system. The legal system, as an agency of social control and tool for resolving disputes.

The court systems, Constitution, torts, crimes, intellectual property, contracts, property rights, employment law, basic business entity law, bankruptcy, administrative agencies, environmental law and agency law.

### ACCT 284: Financial Accounting

(3-0) Cr. 3. F.S.SS.

Introduction to the basic concepts and procedures of financial accounting from a user perspective. The course examines the accounting cycle, business terminology, basic control procedures, and the preparation and evaluation of financial reports, with an emphasis on financial statement analysis.

### ACCT 285: Managerial Accounting

(3-0) Cr. 3. F.S.SS.

*Prereq: ACCT 284*

Understanding of fixed and variable costs and their role in planning, control and performance evaluation. Examination of alternative costing methods. Making decisions by identifying and developing relevant information. Development of spreadsheet skills.

### ACCT 301: The Accounting Cycle

(1-0) Cr. 1. F.S.SS.

*Prereq: ACCT 284*

Interactive computer-based analysis of the accounting cycle including transactions and financial statements. Preparation of journal entries and adjusting entries and completion of the closing process.

### ACCT 315: Business Data Streams and Issues

(Cross-listed with MIS). Cr. 3. Alt. F., offered even-numbered years. Alt. S., offered odd-numbered years. SS.

*Prereq: MIS 301, ACCT 284*

Identification of open data sources and other private data sources.

Develop methods of data access, collection, and sharing; develop methods to validate and standardize data sources; develop methods to assess data worthiness (risk).

**ACCT 383: Intermediate Managerial Accounting**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 285; credit or concurrent enrollment in ACCT 301*

Generation, communication and use of information to assist management with planning, control, and decision making in manufacturing and service organizations. Includes cost concepts and relevance to decision situations, operational and capital budgeting, and performance evaluation. Emphasis on developing effective teamwork skills as well as spreadsheet capabilities.

**ACCT 384: Accounting Information Systems and Analytics**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in ACCT 301; credit or concurrent enrollment in MIS 301*

Concepts and procedures underlying creating, sharing, reporting, storing, and analyzing accounting data. Information technology internal controls and audit techniques. Trends in accounting information systems.

**ACCT 386: Intermediate Financial Accounting I**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 284 and ACCT 301*

The conceptual framework of financial accounting. Communication of financial information on the income and retained earnings statements, statement of cash flows, and the balance sheet. Accounting concepts relating to current and operational assets of the firm.

**ACCT 387: Intermediate Financial Accounting II**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in ACCT 386*

Financial accounting and reporting practices for business entities. Generally accepted accounting principles (GAAP) relative to firm liabilities, equity, income, taxes, employee benefits, leases, accounting changes and cash flows. Discussion of current issues in financial accounting.

**ACCT 401: Financial Management for Healthcare Organizations**

(Cross-listed with HCM). Cr. 3. F.S.

*Prereq: FIN 301; credit or concurrent enrollment in HCM 301*

Examination of the current accounting system for, and the financing of, health care and the factors affecting the industry. Exploration and analysis of budgetary concepts, financial management, cost accounting, and management under rate control and competition, as well as the differences between the goods and service industries. Additional areas of discussion include the practical application of health care finance theory as it applies to the current healthcare environment. The revenue and expense applications will be explored in-depth, particularly in relation to the delivery of health care services. Specific emphasis will be placed on understanding the components of the income statement and balance sheet, developing a budget, and using these financial statements for analyzing operational changes.

**ACCT 416: Business Law**

(Dual-listed with ACCT 516). (3-0) Cr. 3. F.S.

*Prereq: ACCT 215*

Continuation of 215. The Uniform Commercial Code as applied to sales contracts and negotiable instruments. Property law, wills and estates, insurance, secured transactions, corporation law, partnership law and antitrust law.

**ACCT 461: Entrepreneurship and Accounting Information**

(Dual-listed with ACCT 561). (Cross-listed with ENTSP). (3-0) Cr. 3.

Accounting information recording, dissemination, and use by entrepreneurs. Introduces pro forma financials, venture capital, private equity, and state and federal regulations for business creation and formation. Other topics include intrapreneurship, intellectual property, information privacy, cybersecurity, and internal controls, including managing the risk of embezzlement.

**ACCT 483: Application and Communication in Managerial Accounting**

(Dual-listed with ACCT 583). Cr. 3.

*Prereq: ACCT 383 or ACCT 581*

Business simulation focusing on generation and communication of information to assist management with financial decision-making. Emphasis on developing teamwork, written communication, data visualization, and oral presentation skills.

**ACCT 484: Advanced Accounting Information Systems**

(Dual-listed with ACCT 584). (3-0) Cr. 3.

*Prereq: ACCT 384*

Advanced accounting information systems concepts; database design and information retrieval, internal controls within computerized accounting information systems, financial reporting in an electronic environment.

**ACCT 485: Principles of Federal Income Tax**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in ACCT 386 or ACCT 501*

Introduction to the fundamentals of federal income taxation and concepts applicable to all tax entities. Addresses issues related to the measurement and recognition of income, deductions, gains, and losses, taxation of property transactions, and basis / cost recovery concepts. Includes coverage of tax law policy objectives, tax implications of business and investment decisions, tax versus financial reporting treatment of common business transactions, and ethical issues related to tax compliance and planning.

**ACCT 487: Volunteer Income Tax Assistance**

(Dual-listed with ACCT 587). (2-2) Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq: ACCT 285 or ACCT 501 or Permission of Department*

Introduction to and field work in the preparation of individual income tax returns (state and federal). Basic coverage of filing and residency status, taxable income, exemptions, deductions, and credits. Tax software usage and online filing.

**ACCT 488: Governmental and Non-profit Institution Accounting**

(Dual-listed with ACCT 588). (3-0) Cr. 3.

*Prereq: ACCT 386*

Accounting and financial reporting principles of local and state governments, including universities, schools, and hospitals. In addition, accounting and financial reporting of non-profit organizations will be addressed. Financial statements of local governmental units and the university are explored.

**ACCT 489: Corporate Social Responsibility Reporting**

(Dual-listed with ACCT 589). (3-0) Cr. 3. S.

*Prereq: Junior classification or higher*

Theory and practice of social and environmental reporting, the role of the corporation in society, and the mechanisms by which society might hold corporations accountable for their actions.

**ACCT 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Department*

**ACCT 493: Corporate Taxation**

(Dual-listed with ACCT 593). (3-0) Cr. 3. F.S.

*Prereq: ACCT 386*

Introduction to the fundamentals of corporate taxation issues. Discussion of concepts related to the formation and capital structure of corporations. Identification and effect of tax codes and regulations related to corporations. Discussion of operating rules, earnings and profits, distributions, as well as redemptions and liquidations of corporations.

**ACCT 495: Advanced Financial Accounting Problems**

(Dual-listed with ACCT 595). (3-0) Cr. 3.

*Prereq: ACCT 387*

Accounting for business combinations and affiliated companies, intercompany transactions, and consolidated financial statements; Partnership accounting; Segment and Interim Reporting; Multinational accounting.

**ACCT 496: Accounting in the Global Economy**

(Dual-listed with ACCT 596). (3-0) Cr. 3.

*Prereq: ACCT 386 or ACCT 501*

Financial reporting issues in a global environment, including introduction to International Financial Reporting Standards (IFRS) and the potential for the use of IFRS in the U.S. Accounting and managerial issues faced by multinational corporations. Technical issues such as transfer pricing, inflation accounting and taxation will be discussed.

**ACCT 497: Introduction to Auditing**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 384, ACCT 387 and STAT 326*

The conceptual framework of auditing. Professional ethics. External reporting concepts. Audit methodology including risk analysis, internal control, procedures for gathering evidence and the role of statistical sampling in auditing.

**ACCT 498: Accounting Communication and Analysis**

(3-0) Cr. 3. F.

*Prereq: ACCT 387*

Integrative studies in accounting. Development of critical thinking, ethical reasoning, professional research and teamwork skills. Written, visual, and oral communication with corporate stakeholders.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ACCT 501: Financial Accounting**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or Permission of Department*

A general introduction to financial accounting information. Topics covered include the use and analysis of financial information, the regulatory environment, the role of International Financial Reporting Standards (IFRS), and the use of the internet and electronic spreadsheets as a means of accessing and analyzing financial data.

**ACCT 515: Accounting Analytics**

Cr. 3. F.

*Prereq: ACCT 384 or Permission of Department*

Applications and skills for performing data analytics in accounting contexts. Explores conceptual framework for providing data-driven insights and recommendations. Includes hands-on experiences working with different types of data and the latest analysis tools.

**ACCT 516: Business Law**

(Dual-listed with ACCT 416). (3-0) Cr. 3. F.S.

*Prereq:* ACCT 215

Continuation of 215. The Uniform Commercial Code as applied to sales contracts and negotiable instruments. Property law, wills and estates, insurance, secured transactions, corporation law, partnership law and antitrust law.

**ACCT 561: Entrepreneurship and Accounting Information**

(Dual-listed with ACCT 461). (3-0) Cr. 3.

Accounting information recording, dissemination, and use by entrepreneurs. Introduces pro forma financials, venture capital, private equity, and state and federal regulations for business creation and formation. Other topics include intrapreneurship, intellectual property, information privacy, cybersecurity, and internal controls, including managing the risk of embezzlement.

**ACCT 571: Real Estate Law**

(3-0) Cr. 3.

*Prereq:* Enrollment in the MRED or Permission of Department

Fundamentals of real estate finance and development from a legal perspective and in a transactional setting. Topics include land acquisition and finance, choice of entity, tax aspects, management, disposition of real property, and recent legal developments. Legal responsibilities of owners, designers, and contractors are also examined by highlighting typical contractual relationships in place throughout the design and construction process.

**ACCT 580: Exam Preparation**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for certified examinations. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580A: CPA Exam Preparation - AUD**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for the Auditing and Attestation (AUD) section of the Certified Public Accountant (CPA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580B: CPA Exam Preparation - BEC**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for the Business Environment and Concepts (BEC) section of the Certified Public Accountant (CPA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580C: CPA Exam Preparation - FAR**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for the Financial Accounting and Reporting (FAR) section of the Certified Public Accountant (CPA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580D: CPA Exam Preparation - REG**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for the Regulation (REG) section of the Certified Public Accountant (CPA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580E: CMA Exam Preparation - Part 1**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for Part 1 (Financial Planning, Performance, and Analytics) of the Certified Management Accountant (CMA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 580F: CMA Exam Preparation - Part 2**

Cr. 3. F.S.SS.

*Prereq:* Enrollment in Master of Accounting

Preparation for Part 2 (Strategic Financial Management) of the Certified Management Accountant (CMA) examination. Offered on a satisfactory-fail basis only. Only two of ACCT 580A, 580B, 580C, 580D, 580E, and 580F may count toward graduation.

**ACCT 581: Accounting for Decision Making**

(3-0) Cr. 3.

*Prereq:* Graduate Classification

Decision analysis applied to managerial accounting issues. Generation of information for management decision making and control. Responsibility accounting and non-recurring decisions.

**ACCT 582: Corporate Governance and Top Management**

(Cross-listed with MGMT). (3-0) Cr. 3.

*Prereq:* MGMT 503 or permission

Duties, structure, and functioning of top management teams and corporate boards of directors. CEO/board tenure and succession planning, top management compensation, board committee composition, assessment of CEO and board performance, theories of corporate governance, management of the corporate strategic agenda, governance codes, international governance, and chairman/CEO duality. Case studies and contemporary issues discussed.



**ACCT 583: Application and Communication in Managerial Accounting**

(Dual-listed with ACCT 483). Cr. 3.

*Prereq: ACCT 383 or ACCT 581*

Business simulation focusing on generation and communication of information to assist management with financial decision-making. Emphasis on developing teamwork, written communication, data visualization, and oral presentation skills.

**ACCT 584: Advanced Accounting Information Systems**

(Dual-listed with ACCT 484). (3-0) Cr. 3.

*Prereq: ACCT 384*

Advanced accounting information systems concepts; database design and information retrieval, internal controls within computerized accounting information systems, financial reporting in an electronic environment.

**ACCT 585: Taxes and Business Strategy**

(3-0) Cr. 3.

*Prereq: ACCT 485*

Integration of concepts from accounting, finance, and economics to determine how taxes affect business decisions. Provides students with a conceptual framework for thinking about business tax planning and applies it to various common business decisions.

**ACCT 586: Advanced Federal Taxation**

(3-0) Cr. 3.

*Prereq: ACCT 485*

Advanced coverage of federal taxation including issues related to the taxation of corporations, partnerships, estates and trusts, and their owners. Includes coverage of rules, concepts, background, and planning opportunities related to a number of common transactions involving these entities.

**ACCT 587: Volunteer Income Tax Assistance**

(Dual-listed with ACCT 487). (2-2) Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq: ACCT 285 or ACCT 501 or Permission of Department*

Introduction to and field work in the preparation of individual income tax returns (state and federal). Basic coverage of filing and residency status, taxable income, exemptions, deductions, and credits. Tax software usage and online filing.

**ACCT 588: Governmental and Non-profit Institution Accounting**

(Dual-listed with ACCT 488). (3-0) Cr. 3.

*Prereq: ACCT 386*

Accounting and financial reporting principles of local and state governments, including universities, schools, and hospitals. In addition, accounting and financial reporting of non-profit organizations will be addressed. Financial statements of local governmental units and the university are explored.

**ACCT 589: Corporate Social Responsibility Reporting**

(Dual-listed with ACCT 489). (3-0) Cr. 3. S.

*Prereq: Junior classification or higher*

Theory and practice of social and environmental reporting, the role of the corporation in society, and the mechanisms by which society might hold corporations accountable for their actions.

**ACCT 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Department*

For students wishing to do individual research in a particular area of accounting.

**ACCT 591: Fraud Examination and Prevention**

(3-0) Cr. 3.

*Prereq: ACCT 497 or ACCT 501*

Principles and methodology of fraud detection and deterrence. Addresses the causes and elements of fraud, asset theft, corruption, financial statement mis-representation, internal controls for fraud prevention, investigative evidence gathering, and legal aspects of fraud.

**ACCT 592: Financial Statement Analysis**

(3-0) Cr. 3.

*Prereq: ACCT 386 or ACCT 501*

Presentation and analysis of financial statement information from the point of view of the primary users of such data: owners and creditors. Topics include the financial reporting system, the primary financial statements, effects of accounting method choice on reported financial data, and firm valuation.

**ACCT 593: Corporate Taxation**

(Dual-listed with ACCT 493). (3-0) Cr. 3. F.S.

*Prereq: ACCT 386*

Introduction to the fundamentals of corporate taxation issues. Discussion of concepts related to the formation and capital structure of corporations. Identification and effect of tax codes and regulations related to corporations. Discussion of operating rules, earnings and profits, distributions, as well as redemptions and liquidations of corporations.

**ACCT 595: Advanced Financial Accounting Problems**

(Dual-listed with ACCT 495). (3-0) Cr. 3.

*Prereq: ACCT 387*

Accounting for business combinations and affiliated companies, intercompany transactions, and consolidated financial statements; Partnership accounting; Segment and Interim Reporting; Multinational accounting.

**ACCT 596: Accounting in the Global Economy**

(Dual-listed with ACCT 496). (3-0) Cr. 3.

*Prereq: ACCT 386 or ACCT 501*

Financial reporting issues in a global environment, including introduction to International Financial Reporting Standards (IFRS) and the potential for the use of IFRS in the U.S. Accounting and managerial issues faced by multinational corporations. Technical issues such as transfer pricing, inflation accounting and taxation will be discussed.

**ACCT 597: Advanced Auditing and Assurance Services**

(3-0) Cr. 3.

*Prereq: ACCT 497*

A study of advanced auditing and assurance issues. Topics include auditor independence, audit risk analysis, internal control evaluation and reporting, fraud detection, data analytic applications in auditing, audit reporting, auditors' legal liability, and non-financial information assurance.

**ACCT 598: Financial Accounting: Theory and Contemporary Issues**

(3-0) Cr. 3. F.

*Prereq: ACCT 386 or ACCT 501*

Theoretical discussion of the financial accounting and reporting environment. The usefulness of financial accounting information for decision making. Current financial accounting issues, the financial accounting standard setting process, FASB Standards Codification, and the role of the SEC in financial reporting.

**ACCT 599: Creative Component**

Cr. 2.

*Prereq: Admission to the Master of Accounting Program*

This course prepares students to complete their creative component project option in the Master of Accounting degree.

## Actuarial Science (ACSCI)

*Any experimental courses offered by ACSCI can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****ACSCI 391: Actuarial Exam P Lab**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: STAT 326 or STAT 341*

Material review for actuarial exam P. Offered on a satisfactory-fail basis only.

**ACSCI 392: Actuarial Exam FM Lab**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: MATH 240*

Material review for actuarial exam FM. Offered on a satisfactory-fail basis only.

**ACSCI 401: Loss Models I**

(3-0) Cr. 3.

*Prereq: STAT 341*

Probability distributions used to model uncertain events in actuarial practice. Aggregate models, evaluating the effect of various coverage modifications such as deductibles and limits. Construction of empirical models, calculations of common risk measures, and calculations of commonly used severity and frequency models. Various methods for estimating distributional parameters and their properties.

**ACSCI 402: Credibility Theory**

(3-0) Cr. 3.

*Prereq: ACSCI 401*

Method of moments and percentile matching. The method of maximum likelihood estimation for complete individual data, grouped data, censored and truncated data, and variance estimation. Bayesian estimation, including conjugate priors, posterior distributions, and the Poisson-gamma model. Credibility theory, including limited fluctuation credibility, applying Bayesian analysis for both discrete and continuous models, Buhlmann and Buhlmann-Straub models, and their relationship to Bayesian models. Simulating discrete and continuous random variables and the bootstrap method for estimating mean squared error.

## Advertising (ADVRT)

*Any experimental courses offered by ADVRT can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****ADVRT 230: Advertising Principles**

(3-0) Cr. 3.

Historical, social, economic and legal aspects of advertising. Evaluations of advertising research, media, strategy and appeals. Study of the creation of advertising.

**ADVRT 301: Research and Strategic Planning for Advertising and Public Relations**

(Cross-listed with P R). (3-0) Cr. 3.

*Prereq: ADVRT 230 or P R 220*

The use of primary and secondary research for situations, organizations and the public. Formation and development of strategic plans for public relations and advertising students.

**ADVRT 334: Advertising Creativity**

(2-1) Cr. 3.

*Prereq: JL MC 110; Minimum of C+ in JL MC 201; ADVRT 301 or P R 301*

Development and execution of creative advertising materials. Copywriting, art direction and computer applications. Creative strategy development, execution and evaluation.

**ADVRT 335: Advertising Media Planning**

(3-0) Cr. 3.

*Prereq: ADVRT 301 or P R 301*

Concepts of media planning and selection in the development, execution and evaluation of advertising campaigns. Characteristics and capabilities of the advertising media. Utilization of market segmentation, consumer buying and media audience databases.

**ADVRT 336: Advertising Account Management**

(3-0) Cr. 3.

*Prereq: JL MC 110; Minimum of C+ in JL MC 201; ADVRT 301 or P R 301*

Fundamentals of account management with emphasis on leadership, sales techniques, relationship building, presentation skills, and strategic thinking. Includes aspects of agency communications, team building, client management, evaluating creative concepts and media plans, and developing strategic proposals and campaign recommendations.

**ADVRT 390: Professional Skills Development**

(Cross-listed with JL MC, P R). Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Minimum of C+ in JL MC 201; other vary by topic. Instructor permission for non-majors.*

Check with Greenlee School for course availability.

**ADVRT 391: Short Course Intensive**

(Cross-listed with JL MC, P R). Cr. 1-3. Repeatable, maximum of 6 credits.

Focused short courses on timely concepts. Check with Greenlee School for course availability. Offered on a satisfactory-fail basis only.

**ADVRT 434: Advertising Campaigns**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C+ in ADVRT 334 or ADVRT 336; ADVRT major*

Development of advertising campaigns including primary and secondary research, target audience analysis, campaign strategy, media planning, budgeting and creative execution.

**ADVRT 435: Advertising Competition**

Cr. 1-3. Repeatable, maximum of 3 credits. Alt. S., offered irregularly.

*Prereq: Permission of instructor*

Preparation of materials for regional and national competitions. Junior or Senior classification strongly recommended.

**ADVRT 436: Advertising Creative Portfolio**

(3-0) Cr. 3. S.

*Prereq: Minimum of C+ in ADVRT 334, non-majors with instructor permission*

Advanced advertising writing and design. May include campaign development for competitions. Other projects include creative development in a variety of media for an online portfolio.

**ADVRT 473: Social Media Strategy**

(Cross-listed with JL MC, P R). (3-0) Cr. 3. F.S.

*Prereq: Junior classification*

The strategic use of social media, from both an advertising and public relationship standpoint, to the advantage of a client or organization. Examination and analysis of the social media space from a business perspective. Best practices in the areas of strategic planning, tactical execution, and measurement of social media platforms.

**ADVRT 490: Independent Study in Communication**

Cr. arr.

*Prereq: Junior classification; Permission of Instructor*

Projects during which students may study problems associated with a medium, a professional specialization, a philosophical or practical concern, a reportorial method or writing technique, or a special topic in their field. Credit is not given for working on student or professional media without an accompanying research component. No more than 3 credits of ADVRT/JLMC/PR 490 may be used toward a degree in the Greenlee School.

**ADVRT 497: Special Topics in Communication**

(Cross-listed with JL MC, P R). Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Seminars or one-time classes on topics of relevance to students in communication. See Schedule of Classes for topics.

**ADVRT 499: Professional Media Internship**

Cr. 1-3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in P R 321]); Advisor Approval*

See ADVRT/JL MC/P R 499A or 499B. Offered on a satisfactory-fail basis only.

**ADVRT 499A: Professional Media Internship: Required**

Cr. 3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in P R 321]); Advisor Approval*

Initial, required internship. A 400-hour (for 3 credits) internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

**ADVRT 499B: Professional Media Internship: Optional**

Cr. 1-3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in P R 321]); Advisor Approval*

Optional internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

## Aerospace Engineering (AER E)

**Any experimental courses offered by AER E can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**AER E 160: Aerospace Engineering Problems With Computer Applications Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Solving aerospace engineering problems and presenting solutions through technical reports. Significant figures and estimation. SI units. Graphing and curve fitting. Introduction to aerospace engineering and engineering design. Spreadsheet programs. History of aerospace. Systems thinking. Team projects. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**AER E 160H: Aerospace Engineering Problems With Computer Applications Laboratory: Honors**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Solving aerospace engineering problems and presenting solutions through technical reports. Significant figures and estimation. SI units. Graphing and curve fitting. Introduction to aerospace engineering and engineering design. Spreadsheet programs. History of aerospace. Systems thinking. Team projects. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**AER E 161: Numerical, Graphical and Laboratory Techniques for Aerospace Engineering**

(3-2) Cr. 4. F.S.

*Prereq: Credit or concurrent enrollment in AER E 160 or (A B E 160, C E 160, CH E 160, CPR E 185, E E 185, ENGR 160, I E 148, M E 160, or S E 185)*

Computer-based problem solving using Matlab(R), with emphasis on numerical methods. Introduction to solid modeling and aerospace design using SolidWorks.

**AER E 161H: Numerical, Graphical and Laboratory Techniques for Aerospace Engineering: Honors**

(3-2) Cr. 4. F.S.

*Prereq: AER E 160 or (A B E 160, C E 160, CH E 160, CPR E 185, E E 185, ENGR 160, I E 148, M E 160, or S E 185)*

Computer-based problem solving using Matlab(R), with emphasis on numerical methods. Introduction to solid modeling and aerospace design using SolidWorks.

**AER E 192: Aerospace Seminar**

Cr. R. S.

Vectors, differentiation, integration, matrices, and systems of linear equations.

**AER E 192H: Aerospace Seminar: Honors.**

Cr. R. S.

Vectors, differentiation, integration, matrices, and systems of linear equations.

**AER E 261: Introduction to Performance and Design**

(3-0) Cr. 3. F.S.

*Prereq: MATH 166; PHYS 231; PHYS 231L; Credit or concurrent enrollment in AER E 161*

Aerodynamics of the airplane, lift and drag, drag polar, propulsion characteristics of turbojets and piston props, level flight, range, endurance, climbing flight, turning flight, take-off and landing, design examples.

**AER E 265: Scientific Balloon Engineering and Operations**

(Cross-listed with MTEOR). (0-2) Cr. 1. Repeatable. F.

Engineering aspects of scientific balloon flights. Integration of science mission objectives with engineering requirements. Operations team certification. FAA and FCC regulations, communications, and command systems. Flight path prediction and control.

**AER E 290: Aerospace Engineering Independent Study: Independent Study**

Cr. 1-2. Repeatable.

*Prereq: Sophomore classification; Department Permission*

**AER E 290A: Aerospace Engineering Independent Study: Flight ground instruction**

Cr. 1-2. Repeatable.

*Prereq: Sophomore classification; Department Permission***AER E 290B: Aerospace Engineering Independent Study: In-flight training**

Cr. 1-2. Repeatable.

*Prereq: AER E 301; Department Permission***AER E 290C: Aerospace Engineering Independent Study: Other**

Cr. 1-2. Repeatable.

*Prereq: AER E 301; Department Permission***AER E 294: Make to Innovate I**

Cr. 1. Repeatable, maximum of 3 credits. F.S.

*Prereq: Freshman or Sophomore classification*

Multidisciplinary projects to engage students in the fundamentals of engineering, project management, systems engineering, teamwork, and oral and visual communication. Students will define and attain their team objectives and milestones that are approved by the instructor. Can only be used toward graduation in these cases. To make credit deficiencies in 100 or 200 level courses. No more than 2 credits of Aer E 294X can be used to make-up credit deficiencies in 100 or 200 level courses. Cannot be used in any category or technical electives in the Aer E curriculum

**AER E 301: Flight Experience**

Cr. R. F.S.

*Prereq: Credit or concurrent enrollment in AER E 355*

Two hours of in-flight training and necessary ground instruction. Course content prescribed by the Aerospace Engineering Department. Ten hours of flight training certified in a pilot log book can be considered by the course instructor as evidence of satisfactory performance in the course. Offered on a satisfactory-fail basis only.

**AER E 310: Aerodynamics I: Incompressible Flow**

(3-0) Cr. 3. F.S.

*Prereq: MATH 265; C- or better in AER E 261*

Introduction to fluid mechanics and aerodynamics. Fluid properties and kinematics. Conservation equations in differential and integral form. Bernoulli's equation. Basic potential flow concepts and solutions. Boundary layer concept. Incompressible flow over airfoils and wings. Examples of numerical methods. Applications of multi-variable calculus to fluid mechanics and aerodynamics.

**AER E 311: Aerodynamics II: Compressible Flow**

(3-0) Cr. 3. F.S.

*Prereq: AER E 310; M E 231*

Review of thermodynamics, energy equation, compressible flow, and isentropic flow. Normal and oblique shocks. Mach waves and expansion fans. Applications to ducts and nozzles. Compressible airfoil and wing theory. Introduction to advanced compressible flow topics.

**AER E 321: Flight Structures Analysis**

(3-0) Cr. 3. F.S.

*Prereq: E M 324; credit or concurrent enrollment in MATH 266 or MATH 267*

Introduction to elasticity, airworthiness, and flight loads. Introduction to fatigue. Materials selection for flight applications. Thin walled cross-sections under bending, torsion, and shear loads using classical methods. Shear center. Column buckling. Matrix methods of structural analysis.

**AER E 322: Aerospace Structures Laboratory**

(1-2) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in AER E 321*

Design of experiments. Data analysis. Strain gage installation. Measurement of stiffness/strength of aluminum. Analysis/fabrication/testing of riveted joints. Shear/bending measurements in beam sections. Analysis/measurement of strains in frames. Buckling of columns. Stress concentration. Vibration testing of beams and plates. Fabrication/testing of composites.

**AER E 331: Flight Control Systems I**

(3-0) Cr. 3. F.S.

*Prereq: AER E 355*

Linear system analysis. Control system designs using root-locus and frequency response methods. Applications in flight control systems.

**AER E 344: Aerodynamics and Propulsion Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: AER E 310; concurrent enrollment in AER E 311*

Similitude and dimensional analysis. Measurement uncertainty analysis. Pressure and velocity measurement methods and instruments. Pressure distribution around a circular cylinder. Aerodynamic performance of low-speed airfoils. Airfoil wake flow; Boundary layer flow. Flow visualization techniques for supersonic flows and de Laval nozzles.

**AER E 351: Astrodynamics I**

(3-0) Cr. 3. F.S.

*Prereq: M E 345*

Introduction to astrodynamics. Two-body Keplerian satellite and planetary motion. Geocentric and extraterrestrial trajectories and applications. Ballistic missiles.

**AER E 355: Aircraft Flight Dynamics and Control**

(3-0) Cr. 3. F.S.

*Prereq: AER E 261; M E 345; MATH 267*

Aircraft rigid body equations of motion, linearization, and modal analysis. Longitudinal and lateral-directional static and dynamic stability analysis. Flight handling characteristics analysis. Longitudinal and lateral-directional open loop response to aircraft control inputs. Aircraft flight handling qualities.

**AER E 361: Computational Techniques for Aerospace Design**

(2-2) Cr. 3. F.S.

*Prereq: AER E 310; E M 324; (ENGL 309 or ENGL 314); M E 345; MATH 267*

Advanced programming, workstation environment, and development of computational tools for aerospace analysis and design. Technical report writing.

**AER E 362: Aerospace Systems Integration**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250; (Junior classification in Aerospace Engineering or Permission of Instructor)*

Emphasis on impact of component interfaces in aerospace systems. Understand how changes in variables associated with individual components impact the performance of the aerospace system. Solving aerospace engineering problems and presenting solutions through reports. Specific integration challenges include: capturing implicit disciplinary interactions (e.g. structures/aerodynamics, propulsion/aerodynamics, etc.), propagating tolerances through the system (i.e. uncertainty modeling), balancing component attributes in the system objective.

**AER E 381: Introduction to Wind Energy**

(3-0) Cr. 3. S.

*Prereq: MATH 166; PHYS 231; PHYS 231L*

Basic introduction to the fundamentals of Wind Energy and Wind Energy conversion systems. Topics include but not limited to various types of wind energy conversion systems and the aerodynamics, blade and tower structural loads, kinematics of the blades and meteorology.

**AER E 407: Applied Formal Methods**

(Dual-listed with AER E 507). (Cross-listed with COM S). Cr. 3. S.

*Prereq: For AER E majors: AER E 361, For COM S majors: COM S 311, For other majors: AER E 361 or (COM S 311 or an equivalent course); Permission of Instructor*

Introduction to the fundamentals of formal methods, a set of mathematically rigorous techniques for the formal specification, validation, and verification of safety- and security-critical systems. Tools, techniques, and applications of formal methods with an emphasis on real-world use-cases such as enabling autonomous operation. Build experience in writing mathematically analyzable specifications from English operational concepts for real cyberphysical systems, such as aircraft and spacecraft. Review capabilities and limitations of formal methods in the design, verification, and system health management of today's complex systems.

**AER E 411: Aerospace Vehicle Propulsion**

(3-0) Cr. 3. F.S.

*Prereq: AER E 311; AER E 344*

Atmospheric propulsion system performance and cycle analysis. Momentum theorem, thrust and propulsive efficiency. Thermodynamics of compressible flow with heat and work addition. Components and principles of turbojet, ramjet, and turbofan aircraft engines. Introduction to rocket engines.

**AER E 412: Spacecraft Electric Propulsion**

(3-0) Cr. 3. S.

*Prereq: AER E 311*

Electricity and magnetism. Plasma physics. Ion engine performance. Introduction to advanced electromagnetic propulsion systems. Energy sources and nuclear propulsion. Space mission requirements.

**AER E 415: Rocket Propulsion**

(3-0) Cr. 3. F.S.

*Prereq: AER E 311; AER E 344*

Components and principles of liquid rocket engines, solid rocket motors, and hybrid rocket motors. Rocket flight performance and rocket staging. Combustion and thermochemistry. Rocket cooling and nozzle heat transfer. Introduction to nuclear thermal propulsion and electric propulsion systems. Applications to spacecraft.



**AER E 417: Experimental Mechanics**

(Dual-listed with AER E 517). (Cross-listed with E M). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324; MAT E 273

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

**AER E 421: Advanced Flight Structures**

(2-2) Cr. 3. F.S.

*Prereq:* AER E 321; MATH 266 or MATH 267

Analysis of indeterminate flight structures including finite element laboratory. Static analysis of complex structural components subject to thermal and aerodynamic loads. Analytical and finite element solutions for stresses and displacements of membrane, plane stress, plate structures. Buckling of beams, frames, and plate structures. Introduction to vibration of flight structures. Steady state and transient structural response using normal modal analysis.

**AER E 422: Vibrations and Aeroelasticity**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* AER E 321 or E M 324

Vibration theory. Steady and unsteady flows. Mathematical foundations of aeroelasticity, static and dynamic aeroelasticity. Linear unsteady aerodynamics, non-steady aerodynamics of lifting surfaces. Stall flutter. Aeroelastic problems in civil engineering structures. Aeroelastic problems of rotorcraft. Experimental aeroelasticity. Selected wind tunnel laboratory experiments.

**AER E 423: Composite Flight Structures**

(2-2) Cr. 3. S.

*Prereq:* E M 324; MAT E 273

Fabrication, testing and analysis of composite materials used in flight structures. Basic laminate theory of beams, plates and shells. Manufacturing and machining considerations of various types of composites. Testing of composites for material properties, strength and defects. Student projects required.

**AER E 426: Design of Aerospace Structures**

(Dual-listed with AER E 526). (2-2) Cr. 3. F.

*Prereq:* E M 324

Detailed design and analysis of aerospace vehicle structures. Material selection, strength, durability and damage tolerance, and validation analysis. Design for manufacturability.

**AER E 432: Flight Control Systems II**

(3-0) Cr. 3. F.

*Prereq:* AER E 331

Aircraft lateral directional stability augmentation. Launch vehicle pitch control system design. Control of flexible vehicles. Satellite attitude control. Flight control designs based on state-space methods. Introduction to sample-data systems.

**AER E 433: Spacecraft Dynamics and Control**

(3-0) Cr. 3. F.

*Prereq:* M E 345

Three-dimensional rotational kinematics and attitude dynamics of a rigid body in space. Classical stability analysis of spinning spacecraft with or without energy dissipation. Attitude dynamics, stability, and control of spacecraft in a circular orbit in the presence of gravity-gradient torques. Introduction to spacecraft attitude determination and control systems (ADCS) with emphasis on modern attitude determination algorithms. Simulation of spacecraft attitude dynamics and control problems of practical interest using programming and analysis software.

**AER E 442: V/STOL Aerodynamics and Performance**

(3-0) Cr. 3. F.

*Prereq:* AER E 261

Introduction to the aerodynamics, performance, stability, control and critical maneuvering characteristics of V/STOL vehicles. Topics include hovercrafts, jet flaps, ducted fans and thrust vectored engines.

**AER E 445: Experimental Flow Mechanics and Heat Transfer**

(Dual-listed with AER E 545). (3-0) Cr. 3. F.

*Prereq:* A B E 378 or AER E 310 or M E 335

Similitude and dimensional analysis. Measurement uncertainty analysis; Fluid mechanical apparatus: wind tunnel and water tunnels. Various experimental techniques widely used for fluid mechanics, aerodynamics, heat transfer, and combustion studies: Pressure gauge and transducers; Pitot tube; hot wire anemometry; Shadowgraph and Schlieren Photography; laser Doppler velocimetry; particle image velocimetry (PIV); advanced PIV techniques (stereo PIV, 3-D PIV, Tomographic PIV, Holograph PIV and microscopic PIV); laser induced fluorescence; pressure sensitive painting, temperature sensitive painting; molecular tagging velocimetry; molecular tagging thermometry. Extensive applications and laboratory experiments will be included.

**AER E 446: Computational Fluid Dynamics**

(3-0) Cr. 3. F.

*Prereq: AER E 311; AER E 361*

Introduction to computational fluid dynamics. Discretization, consistency, and stability. Explicit and implicit methods for ordinary and partial differential equations. Linearization techniques. Iterative and direct solution algorithms. Numerical methods for parabolic, elliptic and hyperbolic equations. Curvilinear coordinates and numerical grid generation. Applications to Euler, boundary-layer and Navier-Stokes equations. Proficiency in at least one programming language recommended.

**AER E 448: Fluid Dynamics of Turbomachinery**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: AER E 311 or M E 335*

Applications of principles of fluid mechanics and thermodynamics in performance analysis and design of turbomachines. Conceptual and preliminary design of axial and radial flow compressors and turbines using velocity triangles and through-flow approaches.

**AER E 451: Astrodynamics II**

(3-0) Cr. 3. F.S.

*Prereq: AER E 351*

Orbit determination and prediction using Gibb's and Gauss' methods. Advanced orbit maneuvers, triple-, and fixed-impulse; universal variables; Kepler's problem. Earth gravity field models and gravity harmonics, orbit perturbations, advanced dynamics, variational methods, relative orbital mechanics, and Clohessy-Wiltshire equations.

**AER E 452: Introduction To Systems Engineering And Analysis**

(Cross-listed with I E). Cr. 3. SS.

*Prereq: Junior classification in an Engineering major*

Principles of systems engineering to include problem statement formulation, stakeholder analysis, requirements definition, system architecture and concept generation, system integration and interface management, verification and validation, and system commissioning and decommissioning operations. Introduction to discrete event simulation processes. Students will work in groups to propose, research, and present findings for a systems engineering topic of current relevance.

**AER E 461: Modern Design Methodology with Aerospace Applications**

(2-2) Cr. 3. F.S.

*Prereq: AER E 311; AER E 321; AER E 322; AER E 344; AER E 351; AER E 355; AER E 361*

Introduction to modern engineering design methodology. Computational constrained optimal design approach including selection of objective function, characterization of constraint system, materials and strength considerations, and sensitivity analyses. The class contains two focus sections. One section assigns design projects in Aeronautics, and the other assigns design projects in Astronautics.

**AER E 462: Design of Aerospace Systems**

(1-4) Cr. 3. F.S.

*Prereq: AER E 461*

Fundamental principles used in engineering design of aircraft, rockets, and space systems. Preliminary design of aerospace vehicles. Engineering Ethics. The class contains two focus sections. One section assigns design projects in Aeronautics, and the other section assigns design projects in Astronautics.

**AER E 463: Introduction to Multidisciplinary Design Optimization**

(Dual-listed with AER E 563). (3-0) Cr. 3. F.

*Prereq: Senior classification in College of Engineering or Permission of Instructor*

Introduction to the theory and methods of Multidisciplinary Design Optimization (MDO), including system coupling, system sensitivity methods, decomposition methods, MDO formulations (such as multi-discipline feasible (MDF), individual discipline feasible (IDF) and all-at-once (AAO) approaches, and MDO search methods.

**AER E 464: Spacecraft Systems**

(3-0) Cr. 3. S.

*Prereq: AER E 351*

An examination of spacecraft systems including attitude determination and control, power, thermal control, communications, propulsion, guidance, navigation, command and data handling, and mechanisms. Explanation of space and operational environments as they impact spacecraft design. Includes discussion of safety, reliability, quality, maintainability, testing, cost, legal, and logistics issues.

**AER E 468: Large-Scale Complex Engineered Systems (LSCES)**

(Dual-listed with AER E 568). (Cross-listed with I E). (3-0) Cr. 3. S.

*Prereq: Senior classification in College of Engineering or Permission of Instructor*

Introduction to the theoretical foundation and methods associated with the design for large-scale complex engineered systems, including objective function formation, design reliability, value-driven design, product robustness, utility theory, economic factors for the formation of a value function and complexity science as a means of detecting unintended consequences in the product behavior.

**AER E 480: Ultrasonic Nondestructive Evaluation**

(Cross-listed with E M). (3-0) Cr. 3. S.

*Prereq: E M 324; (MATH 266 or MATH 267); PHYS 232*

Introduction to stress/strain, Hooke's law, and elastic wave propagation in two dimensions in isotropic media. Ultrasonic plane-wave reflection and transmission; and simple straight-crested guided waves. Transducer construction, behavior, and performance. Simple signal analysis and discrete signal processing. The last few weeks of the course are devoted to case studies.

**AER E 483: Aeroacoustics**

(Dual-listed with AER E 583). Cr. 3.

*Prereq: (AER E 311 or M E 335); (MATH 266 or MATH 267)*

Noise metrics, Linear wave equation and its solution in 1-, 2-, and 3-D using Green's functions. Propagation of sound in free and confined spaces. Aerodynamic noise sources in engineering machines: aircraft engine noise, airfram noise, wind turbine noise, etc.

**AER E 490: Aerospace Engineering Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490A: Aerospace Engineering Independent Study: Aero and/or Gas Dynamics**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490B: Aerospace Engineering Independent Study: Propulsion**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490C: Aerospace Engineering Independent Study: Aerospace Structures**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490D: Aerospace Engineering Independent Study: Flight Dynamics**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490E: Aerospace Engineering Independent Study: Spacecraft Systems**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490F: Aerospace Engineering Independent Study: Flight Control Systems**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490G: Aerospace Engineering Independent Study: Aeroelasticity**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490H: Aerospace Engineering Independent Study: Independent Study, Honors**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490I: Aerospace Engineering Independent Study: Design**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490J: Aerospace Engineering Independent Study: Non-destructive Evaluation**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490K: Aerospace Engineering Independent Study: Wind Engineering**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490L: Aerospace Engineering Independent Study: Multi-functional Ultra-light Structures**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490M: Aerospace Engineering Independent Study: Intelligent Systems and Autonomy**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 490O: Aerospace Engineering Independent Study: Other**

Cr. 1-6. Repeatable.

*Prereq: Junior or Senior classification; Department Permission*

**AER E 494: Make to Innovate II**

Cr. 2-3. Repeatable, maximum of 3 times. F.S.

*Prereq: Junior or Senior classification; Permission of Instructor*

Multidisciplinary projects to engage students in the fundamentals of engineering, project management, systems engineering, teamwork, and oral and visual communication. Students will define and attain their team objectives and milestones that are approved by their instructors. Maximum of 6 credits may count toward graduation as Technical Elective.

**AER E 499: Senior Project**

Cr. 1-2. Repeatable. F.S.

*Prereq: Senior classification; credit or concurrent enrollment in AER E 491*

Development of aerospace principles and concepts through individual research and projects. Written report.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AER E 501: Advanced Engineering Analysis**

(3-0) Cr. 3. F.

*Prereq: Math 267 or equivalent*

Linear ordinary differential equations with variable coefficients; hyperbolic, parabolic, and elliptic equations; tensors. None

**AER E 507: Applied Formal Methods**

(Dual-listed with AER E 407). (Cross-listed with COM S). Cr. 3. S.

*Prereq: For AER E majors: AER E 361, For COM S majors: COM S 311, For other majors: AER E 361 or (COM S 311 or an equivalent course); Permission of Instructor*

Introduction to the fundamentals of formal methods, a set of mathematically rigorous techniques for the formal specification, validation, and verification of safety- and security-critical systems. Tools, techniques, and applications of formal methods with an emphasis on real-world use-cases such as enabling autonomous operation. Build experience in writing mathematically analyzable specifications from English operational concepts for real cyberphysical systems, such as aircraft and spacecraft. Review capabilities and limitations of formal methods in the design, verification, and system health management of today's complex systems.

**AER E 511: Wind Energy System Design**

(Cross-listed with WESEP). (3-0) Cr. 3.

*Prereq: WESEP 501 and WESEP 502*

Advanced design, control, and operation of wind plants. Topics include electromechanical energy conversion systems, aerodynamic and aeroelastic loads, optimal control of wind farms, life cycle management strategies, tall tower design, and prediction of component residual life.

**AER E 514: Advanced Mechanics of Materials**

(Cross-listed with E M). (3-0) Cr. 3. F.

*Prereq: E M 324*

Theory of stress and strain, stress-strain relationships. Unsymmetrical bending, curved beams, shear center. Torsion of thin-walled noncircular sections. Equilibrium, compatibility equations. Airy stress functions. Membrane stresses in shells, thick-walled cylinders.

**AER E 515: Atomistic and Multiscale Mechanics of Materials**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E M 510; E M 516; AER E 525*

Introduction to atomistic and multiscale computational methodology for the graduate-level study of mechanics of materials. At the end of this course, students will have an awareness and understanding of the application of atomistic and multiscale materials modeling techniques to fracture, plasticity, phase transformation, corrosion, thermal and mass transport in a variety of engineering materials.

**AER E 517: Experimental Mechanics**

(Dual-listed with AER E 417). (Cross-listed with E M). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E M 324; MAT E 273*

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

**AER E 521: Airframe Analysis**

(3-0) Cr. 3. F.

*Prereq: AER E 421 or E M 424*

Analysis of static stresses and deformation in continuous aircraft structures. Various analytical and approximate methods of analysis of isotropic and anisotropic plates and shells.

**AER E 522: Design and Analysis of Composite Materials**

(3-0) Cr. 3. F.

*Prereq: E M 324*

Composite constituent materials, micro-mechanics, laminate analysis, hygro-thermal analysis, composite failure, joining of composites, design of composite beams and plates, honeycomb core, manufacturing of composites, short fiber composites, and demonstration laboratory.

**AER E 524: Numerical Mesh Generation**

(3-0) Cr. 3. F.

*Prereq: MATH 385, proficiency in programming*

Introduction to modern mesh generation techniques. Structured and unstructured mesh methods, algebraic and PDE methods, elliptic and hyperbolic methods, variational methods, error analysis, Delaunay triangulation, data structures, geometric modeling with B-spline and NURBS surfaces, surface meshing.

**AER E 525: Finite Element Analysis**

(Cross-listed with E M). (3-0) Cr. 3. S.

*Prereq: E M 425, MATH 385*

Variational and weighted residual approach to finite element equations. Emphasis on two- and three-dimensional problems in solid mechanics. Isoparametric element formulation, higher order elements, numerical integration, imposition of constraints and penalty, convergence, and other more advanced topics. Use of two- and three-dimensional computer programs. Dynamic and vibrational problems, eigenvalues, and time integration. Introduction to geometric and material nonlinearities.

**AER E 526: Design of Aerospace Structures**

(Dual-listed with AER E 426). (2-2) Cr. 3. F.

*Prereq: E M 324*

Detailed design and analysis of aerospace vehicle structures. Material selection, strength, durability and damage tolerance, and validation analysis. Design for manufacturability.

**AER E 531: Automatic Control of Flight Vehicles**

(3-0) Cr. 3. S.

*Prereq: AER E 331*

Applications of classical and modern linear control theory to automatic control of flight vehicles. Spacecraft attitude control. Control of flexible vehicles. Linear-quadratic regulator design applications.

**AER E 532: Compressible Fluid Flow**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: AER E 310, 311 or equivalent*

Thermodynamics of compressible flow. Viscous and inviscid compressible flow equations. One dimensional steady flow; isentropic flow, shocks, expansions. Multidimensional compressible flow aspects. Linear and nonlinear wave analysis and method of characteristics. Subsonic, transonic, supersonic and hypersonic flows.

**AER E 538: Foundations of Engineering Education**

(Cross-listed with ENGR, HG ED). Cr. 3. F.

*Prereq: Engineering graduate students or instructor permission required*

Introduction to the field of engineering education, with an emphasis on engineering education history, existing challenges, teaching and learning pedagogies and theories, research opportunities, and research methodologies. The course goal is to develop students as scholars and to have students think critically about engineering and education. Students will apply the knowledge gained from this course to propose a research project related to their own discipline. The proposal is intended to help students learn and apply the key elements of engineering education research. This course is intended for students with a variety of interests and career goals, including those interested in learning to conduct engineering education research, exploring research discoveries about teaching and learning, and engaging with the engineering education community.

**AER E 541: Incompressible Flow Aerodynamics**

(3-0) Cr. 3. F.

*Prereq: AER E 310 or M E 335 or equivalent*

Kinematics and dynamics of fluid flow. Derivation of the Navier-Stokes, Euler and potential flow equations. Introduction to generalized curvilinear coordinates. Ideal fluids. Two-dimensional and three-dimensional potential flow. Complex variable methods.

**AER E 545: Experimental Flow Mechanics and Heat Transfer**

(Dual-listed with AER E 445). (3-0) Cr. 3. F.

*Prereq: A B E 378 or AER E 310 or M E 335*

Similitude and dimensional analysis. Measurement uncertainty analysis; Fluid mechanical apparatus: wind tunnel and water tunnels. Various experimental techniques widely used for fluid mechanics, aerodynamics, heat transfer, and combustion studies: Pressure gauge and transducers; Pitot tube; hot wire anemometry; Shadowgraph and Schlieren Photography; laser Doppler velocimetry; particle image velocimetry (PIV); advanced PIV techniques (stereo PIV, 3-D PIV, Tomographic PIV, Holograph PIV and microscopic PIV); laser induced fluorescence; pressure sensitive painting, temperature sensitive painting; molecular tagging velocimetry; molecular tagging thermometry. Extensive applications and laboratory experiments will be included.

**AER E 546: Computational Fluid Mechanics and Heat Transfer I**

(Cross-listed with M E). (3-0) Cr. 3. F.

*Prereq: AER E 310 or M E 335, and programming experience*

Basic concepts of discretization, consistency, and stability. Explicit and implicit methods for ordinary differential equations. Methods for each type of partial differential equation. Iterative solution methods; curvilinear grids. Students will program basic algorithms.

**AER E 547: Computational Fluid Mechanics and Heat Transfer II**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: AER E 546 or equivalent*

Application of computational methods to current problems in fluid mechanics and heat transfer. Methods for solving the Navier-Stokes and reduced equation sets such as the Euler, boundary layer, and parabolized forms of the conservation equations. Introduction to relevant aspects of grid generation and turbulence modeling.

**AER E 551: Orbital Mechanics**

(3-0) Cr. 3. F.

*Prereq: AER E 351*

Review of 2-body problem. Orbital maneuvers. Relative motion in orbit. Orbit perturbation analysis. Gravity field expansions and effects on orbiters. 3-body problem with applications.

**AER E 556: Guidance and Navigation of Aerospace Vehicles**

(3-0) Cr. 3. F.

*Prereq: AER E 331*

Principles of guidance systems for spacecraft, launch vehicles, homing and ballistic missiles. Optimal guidance. Interplanetary transfer guidance with low thrust. Principles of inertial navigation. Theory and applications of the Global Positioning System. Celestial navigation procedures. Application of Kalman filtering to recursive navigation theory.

**AER E 563: Introduction to Multidisciplinary Design Optimization**

(Dual-listed with AER E 463). (3-0) Cr. 3. F.

*Prereq:* Senior classification in College of Engineering or Permission of Instructor

Introduction to the theory and methods of Multidisciplinary Design Optimization (MDO), including system coupling, system sensitivity methods, decomposition methods, MDO formulations (such as multi-discipline feasible (MDF), individual discipline feasible (IDF) and all-at-once (AAO) approaches, and MDO search methods.

**AER E 564: Fracture and Fatigue**

(Cross-listed with E M, M E, M S E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.

*Undergraduates:* Permission of instructor

Materials and mechanics approach to fracture and fatigue.

Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**AER E 565: Systems Engineering and Analysis**

(Cross-listed with E E, I E). (3-0) Cr. 3.

*Prereq:* Coursework in basic statistics

Introduction to organized multidisciplinary approach to designing and developing systems. Concepts, principles, and practice of systems engineering as applied to large integrated systems. Life-cycle costing, scheduling, risk management, functional analysis, conceptual and detail design, test evaluation, and systems engineering planning and organization. Not available for degrees in industrial engineering

**AER E 566: Avionics Systems Engineering**

(Cross-listed with E E). (3-0) Cr. 3. S.

*Prereq:* E E 565

Avionics functions. Applications of systems engineering principles to avionics. Top down design of avionics systems. Automated design tools.

**AER E 568: Large-Scale Complex Engineered Systems (LSCES)**

(Dual-listed with AER E 468). (Cross-listed with I E). (3-0) Cr. 3. S.

*Prereq:* Senior classification in College of Engineering or Permission of Instructor

Introduction to the theoretical foundation and methods associated with the design for large-scale complex engineered systems, including objective function formation, design reliability, value-driven design, product robustness, utility theory, economic factors for the formation of a value function and complexity science as a means of detecting unintended consequences in the product behavior.

**AER E 569: Mechanics of Composite and Combined Materials**

(Cross-listed with E M, M S E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* E M 324

Mechanics of fiber-reinforced materials. Micromechanics of lamina. Macromechanical behavior of lamina and laminates. Strength and interlaminar stresses of laminates. Failure criteria. Stress analysis of laminates. Thermal moisture and residual stresses. Joints in composites.

**AER E 570: Wind Engineering**

(Cross-listed with E M). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* A B E 378, M E 345

Atmospheric circulations, atmospheric boundary layer wind, bluff-body aerodynamics, aeroelastic phenomena, wind-tunnel and full-scale testing, wind-load code and standards, effect of tornado and thunderstorm winds, design applications.

**AER E 572: Turbulence**

(Cross-listed with CH E). (3-0) Cr. 3.

*Prereq:* AER E 541 or M E 538

Qualitative features of turbulence. Statistical representation of turbulent velocity fields: averages, moments, correlations, length and time scales and the energy cascade. Averaged equations of motion, closure requirements, Reynolds averaged models. Homogeneous shear flows, free shear flows, boundary layers. Numerical simulation of turbulence: DNS, LES, DES.

**AER E 573: Random Signal Analysis and Kalman Filtering**

(Cross-listed with E E, M E). (3-0) Cr. 3. F.

*Prereq:* E E 324 or AER E 331 or M E 370 or M E 411 or MATH 341

Elementary notions of probability. Random processes. Autocorrelation and spectral functions. Estimation of spectrum from finite data. Response of linear systems to random inputs. Discrete and continuous Kalman filter theory and applications. Smoothing and prediction. Linearization of nonlinear dynamics.

**AER E 574: Optimal Control**

(Cross-listed with E E, M E). (3-0) Cr. 3. S.

*Prereq:* E E 577

The optimal control problem. Variational approach. Pontryagin's principle, Hamilton-Jacobi equation. Dynamic programming. Time-optimal, minimum fuel, minimum energy control systems. The regulator problem. Structures and properties of optimal controls.



**AER E 575: Introduction to Robust Control**

(Cross-listed with E E, M E). (3-0) Cr. 3.

*Prereq: E E 577*

Introduction to modern robust control. Model and signal uncertainty in control systems. Uncertainty description. Stability and performance robustness to uncertainty. Solutions to the H<sub>2</sub>, H<sub>∞</sub>, and L<sub>1</sub> control problems. Tools for robustness analysis and synthesis.

**AER E 576: Digital Feedback Control Systems**

(Cross-listed with E E, M E). (3-0) Cr. 3. F.

*Prereq: E E 475 or AER E 432 or M E 411 or MATH 415; and MATH 267*

Sampled data, discrete data, and the z-transform. Design of digital control systems using transform methods: root locus, frequency response and direct design methods. Design using state-space methods. Controllability, observability, pole placement, state estimators. Digital filters in control systems. Microcomputer implementation of digital filters. Finite wordlength effects. Linear quadratic optimal control in digital control systems. Simulation of digital control systems.

**AER E 577: Linear Systems**

(Cross-listed with E E, M E, MATH). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or MATH 415; and MATH 207*

Linear algebra review. Least square method and singular value decomposition. State space modeling of linear continuous-time systems. Solution of linear systems. Controllability and observability. Canonical description of linear equations. Stability of linear systems. State feedback and pole placements. Observer design for linear systems.

**AER E 578: Nonlinear Systems**

(Cross-listed with E E, M E, MATH). (3-0) Cr. 3. S.

*Prereq: E E 577*

Linear vs nonlinear systems. Phase plane analysis. Bifurcation and center manifold theory. Lyapunov stability. Absolute stability of feedback systems. Input-output stability. Passivity theory and feedback linearization. Nonlinear control design techniques.

**AER E 581: Perturbation Methods**

(3-0) Cr. 3. F.

*Prereq: MATH 267*

Mathematical perturbation methods with applications to ordinary and partial differential equations. Perturbation expansions. Order of magnitude and gauge functions. Matched asymptotic expansions. Boundary layer problems. Multiple scales. Resonance and mode coupling. Solvability conditions for differential equations. Physical and engineering applications.

**AER E 583: Aeroacoustics**

(Dual-listed with AER E 483). Cr. 3.

*Prereq: (AER E 311 or M E 335); (MATH 266 or MATH 267)*

Noise metrics, Linear wave equation and its solution in 1-, 2-, and 3-D using Green's functions. Propagation of sound in free and confined spaces. Aerodynamic noise sources in engineering machines: aircraft engine noise, airframe noise, wind turbine noise, etc.

**AER E 590: Aerospace Engineering Independent Study: Special Topics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590A: Aerospace Engineering Independent Study: Aero and/or Gas Dynamics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590B: Aerospace Engineering Independent Study: Propulsion**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590C: Aerospace Engineering Independent Study: Aerospace Structures**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590D: Aerospace Engineering Independent Study: Flight Dynamics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590E: Aerospace Engineering Independent Study: Spacecraft Systems**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590F: Aerospace Engineering Independent Study: Flight Control Systems**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590G: Aerospace Engineering Independent Study: Aeroelasticity**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590H: Aerospace Engineering Independent Study: Viscous Aerodynamics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590I: Aerospace Engineering Independent Study: Design**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590J: Aerospace Engineering Independent Study: Hypersonics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590K: Aerospace Engineering Independent Study: Computational Aerodynamics**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590L: Aerospace Engineering Independent Study: Optimization**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590M: Aerospace Engineering Independent Study: Non Destructive Evaluation**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590N: Aerospace Engineering Independent Study: Wind Engineering**

Cr. 1-5. Repeatable, maximum of 3 times.

**AER E 590Q: Aerospace Engineering Independent Study: Astrodynamics**

Cr. 1-5. Repeatable, maximum of 3 times. F.S.SS.

Independent Study for Astrodynamics.

**AER E 590R: Aerospace Engineering Independent Study: Ocean Wave Energy Conversion**

Cr. 1-5. Repeatable, maximum of 3 times. F.S.SS.

Independent Study for Ocean Wave Energy Conversion.

**AER E 591: Graduate Student Seminar Series**

Cr. R. Repeatable.

Presentation of professional topics by department graduate students. Development of presentation skills used in a professional conference setting involving question and answer format.

**AER E 599: Creative Component**

Cr. 1-5. Repeatable.

**Courses for graduate students:****AER E 640: Stability of Fluid Flow**

(3-0) Cr. 3.

*Prereq: AerE 541*

Theoretical methods of stability analysis; linear analysis of exchange of stability and over stability; bifurcation of equilibria; most dangerous modes and pattern formation; shear flow stability theorems. Physical mechanisms. Tollmein-Schlichting waves, disintegration of capillary jets, Benard convection, Taylor-Couette flow, centrifugal instability, double diffusion.

**AER E 647: Advanced Computational Fluid Dynamics**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: AER E 547*

An examination of current methods in computational fluid dynamics. Differencing strategies. Advanced solution algorithms for unstructured meshes. Grid generation. Construction of higher-order CFD algorithms. Parallel computing. Current applications. Use of state of the art CFD codes.

**AER E 651: Space Trajectory Optimization**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AER E 551, or AER E 351*

Classical methods and recent advances in space trajectory optimization. Primer vector theory, introduction to direct and indirect methods for trajectory optimization, the problem of multi gravity assist with deep space maneuvers (MGADSM), optimization of the MGADSM using evolutionary algorithms, hidden genes genetic algorithms for trajectory optimization, and shape-based methods for trajectory design.

**AER E 690: Aerospace Engineering Independent Study: Advanced Topics**

Cr. 1-5. Repeatable.

**AER E 690A: Aerospace Engineering Independent Study: Aero and/or Gas Dynamics**

Cr. 1-5. Repeatable.

**AER E 690B: Aerospace Engineering Independent Study: Propulsion**

Cr. 1-5. Repeatable.

**AER E 690C: Aerospace Engineering Independent Study: Aerospace Structures**

Cr. 1-5. Repeatable.

**AER E 690D: Aerospace Engineering Independent Study: Flight Dynamics**

Cr. 1-5. Repeatable.

**AER E 690E: Aerospace Engineering Independent Study: Spacecraft Systems**

Cr. 1-5. Repeatable.

**AER E 690F: Aerospace Engineering Independent Study: Flight Control Systems**

Cr. 1-5. Repeatable.

**AER E 690G: Aerospace Engineering Independent Study: Aeroelasticity**

Cr. 1-5. Repeatable.

**AER E 690H: Aerospace Engineering Independent Study: Viscous Aerodynamics**

Cr. 1-5. Repeatable.

**AER E 690I: Aerospace Engineering Independent Study: Design**

Cr. 1-5. Repeatable.

**AER E 690J: Aerospace Engineering Independent Study: Hypersonics**

Cr. 1-5. Repeatable.

**AER E 690K: Aerospace Engineering Independent Study: Computational Aerodynamics**

Cr. 1-5. Repeatable.

**AER E 690L: Aerospace Engineering Independent Study: Non Destructive Evaluation**

Cr. 1-5. Repeatable.

**AER E 690M: Aerospace Engineering Independent Study: Wind Engineering**

Cr. 1-5. Repeatable.

**AER E 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq: Permission of DOGE (Director of Graduate Education), graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**AER E 699: Research**

Cr. arr. Repeatable.

# African and African American Studies (AF AM)

*Any experimental courses offered by AF AM can be found at:*

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****AF AM 201: Introduction to African American Studies**

(3-0) Cr. 3. F.S.

An interdisciplinary introduction to the study of African American culture. Includes history, the social sciences, literature, religion, and the arts, as well as conceptual frameworks for investigation and analysis of the African American experience.

Meets U.S. Diversity Requirement

**AF AM 310: Africa to 1880**

(Cross-listed with HIST). Cr. 3.

*Prereq: Sophomore classification*

Survey of the history of African societies, cultures and civilizations from earliest times to 1880. Evolution of states across the continent; social, economic, political, and cultural developments; nature and consequences of African interactions and relationship with Europeans.

Meets International Perspectives Requirement.

**AF AM 311: Africa under Colonial Rule**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Development of Africa from imposition of colonial rule to independence, including processes of European domination, African reaction and resistance, emergence of nationalism, and dismantling of colonialism.

Meets International Perspectives Requirement.

**AF AM 327: Strategies of Resistance: From Slavery to Hip-Hop & Black Lives Matter**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Analysis of strategies of resistance and protest against inequality within African American communities; emphasis on the historical, socio-political and economic contexts in which resistance emerges; includes examination of contemporary forms of protests.

**AF AM 330: Ethnic and Race Relations**

(Cross-listed with SOC). (3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Analysis of ethnic and race relations, particularly in America; emphasis on the sociology and psychology of race and ethnic relations.

**AF AM 334: Africana Religions**

(Cross-listed with RELIG). (3-0) Cr. 3. F.

A focused study of the religious histories and cultures of West Africans and their descendants in the Americas. Topics include West African traditions, Christianity, Islam, and indigenous Afro-Caribbean religions, with attention to their gendered, theological, and cultural dimensions. Prior course work in Religious Studies or African American Studies recommended.

**AF AM 335: Race, Ethnicity, and the US Criminal Justice System**

(Cross-listed with C J). Cr. 3.

*Prereq: AF AM 201 or C J 240*

Empirical and theoretical readings on the intersection of race, ethnicity, crime, and the criminal justice system in contemporary society. Topics include, but are not limited to racial and ethnic relations in society, media, violence, policing, and disparity and discrimination in crime and punishment. Criminological theories of racial and ethnic antagonism.

**AF AM 347: Studies in African American Literature**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of literature by African American writers. May include focus on a particular genre (fiction, non-fiction, poetry, film, drama, media), author, event, movement, or theme.

**AF AM 350: Women of Color in the U.S**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: 3 credits in WGS or AF AM*

Economic, social, political and cultural roles of Women of Color in the U.S. Includes literary, philosophical, and artistic expressions. Myths and realities explored.

**AF AM 353: History of African Americans I**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Examines African roots of black culture and the African American experience in the United States from the colonial period through the Civil War. Topics include Atlantic Slave Trade, slavery and American identity, abolition, the emergence of Black Nationalism, and black participation in the Civil War.

Meets U.S. Diversity Requirement

**AF AM 354: History of African Americans II**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Explores African American political thought and political action from Reconstruction to the present. Topics include rise of Jim Crow segregation, urban migration, Garvey movement, Harlem Renaissance, Depression and world wars, Pan-Africanism, civil rights, Black Power, and black feminism.

Meets U.S. Diversity Requirement

**AF AM 355: Understanding Sub-Saharan Africa**

(Cross-listed with ANTHR). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Sophomore classification*

Survey of economic, social, political and historical processes that have shaped representations of Africa and Africans. Topics include colonialism, globalization, gender and LGBTQ rights, conflict and representations in Western media.

Meets International Perspectives Requirement.

**AF AM 460: Seminar in African American Culture**

(3-0) Cr. 3. S.

Intensive study of a selected topic in African-American Studies in one or more disciplines. Selected readings of various authors, movements, eras, or genres. Primary and secondary source materials.

**AF AM 473: Civil Rights and Ethnic Power**

(Cross-listed with HIST, US LS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Comparative history of the civil rights and ethnic power movements (African American, Chicano, American Indian, Puerto Rican, among others) in the U.S. from World War II to the present. Topics include institutional foundations, leadership, gender and racial dynamics, and the convergences and divergences of these differing ethnic struggles for rights.

Meets U.S. Diversity Requirement

**AF AM 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

## Agricultural and Biosystems Engineering (A B E)

*Any experimental courses offered by A B E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****A B E 102: Learning Communities**

Cr. 0.5. F.

8 week learning communities course focusing on student success, engineering, and department curriculum. Building community within the ABE Department. Offered on a satisfactory-fail basis only.

**A B E 110: Experiencing Agricultural and Biosystems Engineering**

(0-2) Cr. 1. S.

Laboratory-based, team-oriented experiences in a spectrum of topics common to the practice of agricultural and biosystems engineering. Report writing, co-ops, internships, careers, registration planning.

**A B E 160: Systematic Problem Solving and Computer Programming**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in (MATH 143 or MATH 165)*

Systematic problem-solving using principles of dynamics, statics, mass/energy conservation, and algorithmic thinking. Use of spreadsheet programs and computer programming language(s) to solve engineering problems. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**A B E 170: Engineering Graphics and Introductory Design**

(2-2) Cr. 3.

Applications of multi-view drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process including written and oral reports.

**A B E 201: Preparing for Workplace Seminar**

(Cross-listed with TSM). (1-0) Cr. 1. F.S.

*Prereq: Major in AE, AST, BSE, or I TEC; Sophomore classification*

8 week course. Professionalism in the context of the engineering/technical workplace. Development of intrapersonal and interpersonal qualities including talent assessment; key workplace competency demonstration; leadership practice assessment; preparation of resume; cover letter preparation and behavioral-based interviewing; readiness for internship attainment.

**A B E 216: Fundamentals of Agricultural and Biosystems Engineering**

(3-0) Cr. 3. F.

*Prereq: A B E 160 or Permission of Instructor*

Application of mathematics and engineering sciences in agricultural and biosystems engineering. Emphasis is on solving engineering problems.

**A B E 218: Project Management & Design in Agricultural and Biosystems Engineering**

(1-2) Cr. 2. S.

*Prereq: A B E 216*

Engineering design process with emphasis on criteria and constraints, ideation, and analysis. Fundamental principles of project management including project management software. Open-ended project(s) to apply core principles using concepts from prerequisite courses.

**A B E 271: Engineering Applications of Parametric Solid Modeling**

(1-2) Cr. 1. F.S.

*Prereq: A B E 170 or TSM 116*

8 week-course. Creating, editing, and documenting part and assembly models using Solidworks. Emphasis on developing engineering drawings to communicate designs. Portfolio creation to document learning and understanding of parametric modeling.

**A B E 272: Parametric Solid Models, Drawings, and Assemblies Using Creo Parametric**

(1-2) Cr. 1. F.S.

*Prereq: A B E 170 or TSM 116*

8 week-course. Applications of Creo Parametric software. Create solid models of parts and assemblies. Utilize the solid models to create design documentation (standard drawing views, dimensions, and notes) and for the geometric analysis of parts and assemblies.

**A B E 273: CAD for Process Facilities and Land Use Planning**

(1-2) Cr. 1. F.S.

*Prereq: ENGR 170 or TSM 116*

8-week course. Application of 2-D AutoCAD software to create and interpret 2-D drawings of factories, facilities, and landscape structures. Topics include geometric construction, and design documentation using views, dimension, notes, and title blocks, and AutoCAD specific features such as Layers, Blocks, Standards, Styles.

**A B E 316: Applied Numerical Methods for Agricultural and Biosystems Engineering**

(2-2) Cr. 3. F.S.

*Prereq: A B E 160; (MATH 266 or MATH 267)*

Computer aided solution of engineering problems by use of numerical techniques and mathematical models. Systems analysis and optimization applicable to agricultural and biological systems.

**A B E 325: Biorenewable Systems**

(Cross-listed with TSM). (3-0) Cr. 3. F.

*Prereq: CHEM 163 or higher; MATH 140 or higher*

Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, and transportation/logistics.

**A B E 327L: Animal Production Systems Design Lab**

(0-2) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in TSM 327*

Engineering analysis of Livestock and Poultry production systems as related to applications of Precision Livestock Farming Technology (PLFT), economic and environmental management, and manure and nutrient management. Focus on the design of animal production systems based on ASABE/NRCS Standards and Local Codes. Concrete and earthen manure storages and open-lot runoff management structures; utilization of RUSLE-2 and P-index in the development of comprehensive nutrient management plans; making economic and environmental management decisions related to improving production, gaseous emissions reporting, and odor mitigation.

**A B E 340: Functional Analysis of Soil, Crop, and Machine Systems**

(2-2) Cr. 3. F.

*Prereq: A B E 216*

Principles of machine systems operation (tillage, crop establishment, harvesting and crop protection). Principles of soil and crop interactions with machine systems. Experimental and simulation techniques for testing and evaluation of agricultural field machinery for equipment performance, functional analysis and crop production management.

**A B E 342: Agricultural Tractor Power**

(2-3) Cr. 3. S.

*Prereq: CH E 381 or M E 231*

Thermodynamic principles and construction of tractor engines. Fuels, combustion, and lubrication. Kinematics and dynamics of tractor power applications; drawbar, power take-off and traction mechanisms.

**A B E 363: Agri-Industrial Applications of Electric Power and Electronics**

(3-2) Cr. 4. F.S.

*Prereq: A B E 216*

Single phase and three phase circuit design. Electrical safety. Electric motors and controls. Programmable logic controllers. Digital logic, instrumentation and sensors.

**A B E 378: Mechanics of Fluids**

(3-0) Cr. 3. F.S.SS.

*Prereq: C E 274*

Properties of fluids. Fluid statics. Kinematics and kinetics of fluid flow. Mass, momentum, and energy conservation laws; dimensional analysis; flow in pipes and channels.

**A B E 378L: Mechanics of Fluids Laboratory**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in A B E 378*

Exploration of properties of fluids through selected laboratory experiments. Fluid statics. Kinematics and kinetics of fluid flow. Mass, momentum, and energy conservation laws. Dimensional analysis. Flow in pipes and channels.

**A B E 380: Principles of Biological Systems Engineering**

(2-3) Cr. 3. S.

*Prereq: A B E 316*

Engineering analysis of biological systems, through the study of mass, energy, and information transport. Quantification and modeling of biological interactions, biological activities and bioreactor operations. Includes laboratory experiences on biological materials characterization, unit operation for bioprocesses and fermentation for producing bioproducts.

**A B E 388: Sustainable Engineering and International Development**

(Cross-listed with C E, E E). (2-2) Cr. 3. F.

*Prereq: Junior classification in an Engineering Major*

Multi-disciplinary approach to sustainable engineering and international development, sustainable development, appropriate design and engineering, feasibility analysis, international aid, business development, philosophy and politics of technology, and ethics in engineering. Engineering-based projects from problem formulation through implementation. Interactions with partner community organizations or international partners such as nongovernment organizations (NGOs). Course readings, final project/design report. Meets International Perspectives Requirement.

**A B E 403: Physical Modeling and Control of Dynamic Systems**

(Dual-listed with A B E 503). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A B E 316; A B E 363; (MATH 266 or MATH 267)*

Modeling and simulation of dynamic systems with physical modeling tools such as Simscape or Modelica. System concepts and engineering system analogies. Time and frequency response of systems. Introduction to control theory. Open-ended term project required for graduate credit.

**A B E 404: Instrumentation for Agricultural and Biosystems Engineering**

(Dual-listed with A B E 504). (2-2) Cr. 3. F.

*Prereq: A B E 316; A B E 363*

Interfacing techniques for computer-based data acquisition and control systems. Basic interfacing components including A/D and D/A conversion, signal filtering and process control. Sensors and theory of operation applied to practical monitoring and control problems. Data collection, analysis, and calibration of sensors and data acquisition systems. Individual project required for graduate credit.

**A B E 410: Electronic Systems Integration for Agricultural Machinery**

(Dual-listed with A B E 510). (2-2) Cr. 3. S.

System architecture and design of electronics used in agricultural machinery and production systems. Emphasis on information technology and systems integration for automated agriculture processes. Design of Controller Area Network (CAN BUS) communication systems and discussion of relevant standards (ISO 11783 and SAE J1939). Application of technologies for sensing, distributed control, and automation of agricultural machinery will be emphasized.

**A B E 413: Fluid Power Engineering**

(Cross-listed with M E). (2-2) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (A B E 378 or M E 335); (A B E 216 or M E 270)*

Fundamental fluid power principles, symbols and schematics. Hydraulic fluid properties. Function and performance of components such as connections and fittings, filtration, pumps, valves, actuators, hydrostatic transmissions. Hydraulic system dynamics. Modeling and simulation of circuits. Analysis and design of hydraulic systems. Hydrostatic transmission design. Hands-on construction of circuits, measurement of system variables, and electrohydraulic control.

**A B E 415: Agricultural & Biosystems Engineering Design I**

(1-2) Cr. 2. F.S.

*Prereq: A E or BSE major; A B E 316*

Engineering design process with emphasis on team delivery of: clearly defined deliverables; criteria and constraints; wide-field ideation; discipline-appropriate analysis methods; identification and application of relevant standards.

**A B E 416: Agricultural & Biosystems Engineering Design II**

(1-2) Cr. 2. F.S.

*Prereq: A B E 415*

Final execution of the engineering design process with emphasis on team delivery of: oral and written communication in completion of the client-agreed deliverables.

**A B E 418: Fundamentals of Engineering Review**

(1-0) Cr. 1.

*Prereq: Senior classification*

8 week course. Review of core concepts covered in the Fundamentals of Engineering examination with emphasis on statics, dynamics, fluid mechanics, heat transfer, electric circuits, and engineering economics. Open to all College of Engineering seniors, however focus is on the general exam, not discipline specific exams.



**A B E 424: Air Pollution**

(Dual-listed with A B E 524). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 424A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with A B E 524A). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 424B: Air Pollution: Climate change and causes**

(Dual-listed with A B E 524B). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 424C: Air Pollution: Transportation Air Quality**

(Dual-listed with A B E 524C). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A*

**A B E 424D: Air Pollution: Off-gas treatment technology**

(Dual-listed with A B E 524D). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B*

**A B E 424E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with A B E 524E). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 431: Design and Evaluation of Soil and Water Conservation Systems**

(Dual-listed with A B E 531). (2-3) Cr. 3. F.

*Prereq: A B E 378 or CH E 356*

Hydrology and hydraulics in agricultural and urbanizing watersheds. Design and evaluation of systems for the conservation and quality preservation of soil and water resources. Use and analysis of hydrologic data in engineering design; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality preservation of soil and water for agriculture. Small watershed hydrology, water movement and utilization in the soil-plant-atmosphere system, agricultural water management, best management practices, and agricultural water quality.

**A B E 432: Nonpoint Source Pollution and Control**

(Dual-listed with A B E 532). (3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: A B E 431 or C E 372*

Characteristics and mechanisms of non-point source (NPS) pollution in agricultural and urban watersheds, modeling of NPS pollution for terrestrial and aquatic systems, statistical tools to assess environmental datasets, strategies to control and manage NPS pollution of water bodies, and integrated watershed management. Graduate students are required to develop/deliver lecture models on assigned topics and/or complete additional assignments.

**A B E 437: Watershed Modeling and Policy**

(Dual-listed with A B E 537). (2-2) Cr. 3. Alt. F., offered irregularly.

*Prereq: C E 372*

A project-based course on watershed-scale models for improving water quality. Legislative and judicial basis of the Total Maximum Daily Load (TMDL) program; approaches to TMDL development; principles and techniques for implementation; stakeholder engagement strategies. Hands-on experiences with GIS-interfaced models, data sources, calibration/validation, statistical assessment of model results, and simulation using multiple tools. In addition to other assignments, graduate students will present case studies of TMDLs using different modeling tools.

**A B E 451: Food and Bioprocess Engineering**

(Dual-listed with A B E 551). (3-0) Cr. 3. S.

*Prereq: A B E 216; credit or concurrent enrollment in (CH E 357 or M E 436) or (FS HN 351; [MATH 266 or MATH 267])*

Application of engineering principles and mathematical modeling to the quantitative analysis of transport phenomena in food and bioprocesses. Physical/chemical characteristics of foods and biological materials and systems, flow processes, thermal processes, cooling/freezing processes, dehydration processes and separation processes.

**A B E 469: Engineering for Grain Storage, Preservation, Handling, and Processing Systems**

(Dual-listed with A B E 569). (2-3) Cr. 3. S.

*Prereq: A B E 216*

Cereal grain and oilseed production, properties, and quality assessment. Design of storage systems, drying systems, material handling, and size reduction systems. Design of cereal grain processing systems, including dry milling, wet milling, flour milling, feed milling, and fermentation facilities. Students enrolled in ABE 569 will be required to conduct additional learning activities.

**A B E 472: Controlled Environments for Animals and Plants**

(Dual-listed with A B E 572). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A B E 216; M E 231*

Principles and design of environmental control systems for animal and plant facilities. Insulation, heat and mass transfer, fans, ventilation, air distribution, heating and cooling equipment, and controls. Individual projects required for graduate credit.

**A B E 478: Wood Frame and Agri-Industrial Structures**

(Dual-listed with A B E 578). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: E M 324*

Design of light-framed wood structures using LRFD and ASD design procedures. Includes analysis of wind, snow, dead, and live loads. Applications include animal housing, greenhouses, and storage structures. Fasteners, laminated posts, truss design and use of National Design Specifications.

**A B E 480: Engineering Analysis of Biological Systems**

(Dual-listed with A B E 580). (Cross-listed with ENSCI, GLOBE). (2-2) Cr. 3. F.

*Prereq: A B E 380 or Permission of Instructor*

Systems-level quantitative analysis of various biological systems, including applications in foods, feeds, biofuels, bioenergy, and other bio-based systems. Introduction to techno-economic analysis and life-cycle assessment of these systems at multiple production scales. Applying these tools to evaluate and improve cost and sustainability performance. Students enrolled in ABE 580 will be required to conduct additional learning activities.

**A B E 490: A B E Independent Study**

Cr. 1-5. Repeatable.

*Prereq: Permission of Instructor*

Independent Study.

**A B E 490A: A B E Independent Study: Animal Production Systems Engineering**

Cr. 1-5. Repeatable.

*Prereq: Permission of Instructor*

Independent Study.

**A B E 490B: A B E Independent Study: Biorenewable Resources**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study.

**A B E 490E: A B E Independent Study: Environmental Bioprocessing Engineering**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in environmental bioprocessing engineering.

**A B E 490F: A B E Independent Study: Food Engineering**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in food engineering.

**A B E 490G: A B E Independent Study: General Topics in A B E**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in general A B E topics.

**A B E 490H: A B E Independent Study: Honors**

Cr. 1-5. Repeatable.

*Prereq: Permission of Instructor*

Guided instructing in agricultural and biosystems engineering for honors students.

**A B E 490L: A B E Independent Study: Land & Water Resources Engineering**

Cr. 1-5. Repeatable.

*Prereq: Permission of Instructor*

Guided instruction in land and water resources engineering.

**A B E 490M: A B E Independent Study: Advanced Machinery Systems Engineering**

Cr. 1-5. Repeatable.

*Prereq: Permission of Instructor*

Guided instruction in advance machinery systems engineering.

**A B E 495: Agricultural and Biosystems Engineering Department Study Abroad Preparation or Follow-up**

(Cross-listed with TSM). Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Advisor Permission*

Preparation for, or follow-up of, study abroad experience (496). For preparation, course focuses on understanding the tour destination through readings, discussions, and research on topics such as the regional industries, climate, crops, culture, economics, food, geography, government, history, natural resources, and public policies. For follow-up, course focuses on presentations by students, report writing, and reflection. Students enrolled in this course intend to register for 496 the following term or have had taken 496 the previous term.

Meets International Perspectives Requirement.

**A B E 496: Agricultural and Biosystems Engineering Department Study Abroad**

(Cross-listed with TSM). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Advisor Permission*

Tour and study at international sites relevant to disciplines of industrial technology, biological systems engineering, agricultural systems technology, and agricultural engineering. Location and duration of tours will vary. Trip expenses paid by students. Pre-trip preparation and/or post-trip reflection and reports arranged through 495.

Meets International Perspectives Requirement.

**Courses primarily for graduate students, open to qualified undergraduates:****A B E 503: Physical Modeling and Control of Dynamic Systems**

(Dual-listed with A B E 403). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A B E 316; A B E 363; (MATH 266 or MATH 267)*

Modeling and simulation of dynamic systems with physical modeling tools such as Simscape or Modelica. System concepts and engineering system analogies. Time and frequency response of systems. Introduction to control theory. Open-ended term project required for graduate credit.

**A B E 504: Instrumentation for Agricultural and Biosystems Engineering**

(Dual-listed with A B E 404). (2-2) Cr. 3. F.

*Prereq: A B E 316; A B E 363*

Interfacing techniques for computer-based data acquisition and control systems. Basic interfacing components including A/D and D/A conversion, signal filtering and process control. Sensors and theory of operation applied to practical monitoring and control problems. Data collection, analysis, and calibration of sensors and data acquisition systems. Individual project required for graduate credit.

**A B E 506: Applied Computational Intelligence**

(2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: A B E 316 or equivalent, MATH 166, STAT 305*

Applications of biologically inspired computational intelligence tools for data mining, system modeling, and optimization for agricultural, biological and other engineered systems. Introduction to Artificial Neural Networks, Support Vector Machines, Fuzzy Logic, Genetic Algorithms, Bayesian and Decision Tree learning. Fundamental Machine Vision techniques will be introduced in the first part of course and be integrated into the lab exercises for learning different computational intelligence techniques. MATLAB will be used throughout the course for algorithm implementation.

**A B E 510: Electronic Systems Integration for Agricultural Machinery**

(Dual-listed with A B E 410). (2-2) Cr. 3. S.

System architecture and design of electronics used in agricultural machinery and production systems. Emphasis on information technology and systems integration for automated agriculture processes. Design of Controller Area Network (CAN BUS) communication systems and discussion of relevant standards (ISO 11783 and SAE J1939). Application of technologies for sensing, distributed control, and automation of agricultural machinery will be emphasized.

**A B E 511: Bioprocessing and Bioproducts**

(3-0) Cr. 3. S.

*Prereq: A B E 469, senior or graduate classification*

Unit operations for production of bio-based, fermented fuels, beverages, chemicals, pharmaceuticals, and coproducts. Taxonomy, metabolism, kinetics, and modeling of aerobic and anaerobic fermentation systems. Mass/energy balances, pretreatments, liquefaction, saccharification, separations, and process integration.

**A B E 515: Integrated Crop and Livestock Production Systems**

(Cross-listed with AGRON, AN S, SUSAG). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SUSAG 509*

Methods to maintain productivity and minimize the negative ecological effects of agricultural systems by understanding nutrient cycles, managing manure and crop residue, and utilizing multispecies interactions. Crop and livestock production within landscapes and watersheds is also considered. Course includes a significant field component, with student teams analyzing Iowa farms.

**A B E 524: Air Pollution**

(Dual-listed with A B E 424). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 524A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with A B E 424A). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 524B: Air Pollution: Climate change and causes**

(Dual-listed with A B E 424B). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 524C: Air Pollution: Transportation Air Quality**

(Dual-listed with A B E 424C). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A*

**A B E 524D: Air Pollution: Off-gas treatment technology**

(Dual-listed with A B E 424D). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B*

**A B E 524E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with A B E 424E). (Cross-listed with C E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**A B E 531: Design and Evaluation of Soil and Water Conservation Systems**

(Dual-listed with A B E 431). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: A B E 378 or CH E 356*

Hydrology and hydraulics in agricultural and urbanizing watersheds. Design and evaluation of systems for the conservation and quality preservation of soil and water resources. Use and analysis of hydrologic data in engineering design; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality preservation of soil and water for agriculture. Small watershed hydrology, water movement and utilization in the soil-plant-atmosphere system, agricultural water management, best management practices, and agricultural water quality.

**A B E 532: Nonpoint Source Pollution and Control**

(Dual-listed with A B E 432). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: A B E 431 or C E 372*

Characteristics and mechanisms of non-point source (NPS) pollution in agricultural and urban watersheds, modeling of NPS pollution for terrestrial and aquatic systems, statistical tools to assess environmental datasets, strategies to control and manage NPS pollution of water bodies, and integrated watershed management. Graduate students are required to develop/deliver lecture models on assigned topics and/or complete additional assignments.

**A B E 533: Erosion and Sediment Transport**

(Cross-listed with ENSCI, NREM). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372 or GEOL/ENSCI/MTEOR 402, MATH 166 or equivalent*

Soil erosion processes, soil loss equations and their application to conservation planning, sediment properties, initiation of sediment motion and over land flow, flow in alluvial channels and theory of sediment transport, channel stability, reservoir sedimentation, wind erosion, BMPs for controlling erosion.

**A B E 537: Watershed Modeling and Policy**

(Dual-listed with A B E 437). (Cross-listed with ENSCI). (2-2) Cr. 3. Alt. F., offered irregularly.

*Prereq: C E 372*

A project-based course on watershed-scale models for improving water quality. Legislative and judicial basis of the Total Maximum Daily Load (TMDL) program; approaches to TMDL development; principles and techniques for implementation; stakeholder engagement strategies. Hands-on experiences with GIS-interfaced models, data sources, calibration/validation, statistical assessment of model results, and simulation using multiple tools. In addition to other assignments, graduate students will present case studies of TMDLs using different modeling tools.

**A B E 551: Food and Bioprocess Engineering**

(Dual-listed with A B E 451). (3-0) Cr. 3. S.

*Prereq: A B E 216; credit or concurrent enrollment in (CH E 357 or M E 436) or (FS HN 351; [MATH 266 or MATH 267])*

Application of engineering principles and mathematical modeling to the quantitative analysis of transport phenomena in food and bioprocesses. Physical/chemical characteristics of foods and biological materials and systems, flow processes, thermal processes, cooling/freezing processes, dehydration processes and separation processes.

**A B E 556: GIS Programming and Automation**

(Dual-listed with A B E 556). (Cross-listed with C R P). (3-0) Cr. 3. F.

*Prereq: C R P 351*

Introduction to automated geoprocessing in Geographic Information Systems using Python. Focus on learning scripting language and object-oriented programming, automation of custom-designed geoprocessing scripts, and application toward student research and/or interests.

**A B E 569: Engineering for Grain Storage, Preservation, Handling, and Processing Systems**

(Dual-listed with A B E 469). (2-3) Cr. 3. S.

*Prereq: A B E 216*

Cereal grain and oilseed production, properties, and quality assessment. Design of storage systems, drying systems, material handling, and size reduction systems. Design of cereal grain processing systems, including dry milling, wet milling, flour milling, feed milling, and fermentation facilities. Students enrolled in ABE 569 will be required to conduct additional learning activities.

**A B E 572: Controlled Environments for Animals and Plants**

(Dual-listed with A B E 472). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A B E 216; M E 231*

Principles and design of environmental control systems for animal and plant facilities. Insulation, heat and mass transfer, fans, ventilation, air distribution, heating and cooling equipment, and controls. Individual projects required for graduate credit.

**A B E 578: Wood Frame and Agri-Industrial Structures**

(Dual-listed with A B E 478). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: E M 324*

Design of light-framed wood structures using LRFD and ASD design procedures. Includes analysis of wind, snow, dead, and live loads. Applications include animal housing, greenhouses, and storage structures. Fasteners, laminated posts, truss design and use of National Design Specifications.

**A B E 580: Engineering Analysis of Biological Systems**

(Dual-listed with A B E 480). (2-2) Cr. 3. F.

*Prereq: A B E 380 or Permission of Instructor*

Systems-level quantitative analysis of various biological systems, including applications in foods, feeds, biofuels, bioenergy, and other bio-based systems. Introduction to techno-economic analysis and life-cycle assessment of these systems at multiple production scales. Applying these tools to evaluate and improve cost and sustainability performance. Students enrolled in ABE 580 will be required to conduct additional learning activities.

**A B E 590: Special Topics in Agricultural & Biosystems Engineering**

Cr. 1-3. Repeatable.

Guided instruction and self-study on special topics relevant to agricultural and biosystems engineering.

**Courses for graduate students:****A B E 601: Graduate Seminar**

(Cross-listed with TSM). (1-0) Cr. 1. F.

Keys to starting a successful graduate research project. Effective literature review, formulating research questions, and setting goals. Practicing effectively communicating research and science. Effective strategies for scholarly writing, professional development, responding to feedback, peer-reviewing, successful publishing in journals, and curating scholarly output.

**A B E 610: Foundations of Sustainable Agriculture**

(Cross-listed with AGRON, ANTHR, SOC, SUSAG). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**A B E 690: Advanced Topics**

Cr. arr. Repeatable.

Advanced topics.

**A B E 694: Teaching Practicum**

(Cross-listed with TSM). Cr. 1-3. F.S.

*Prereq: Graduate classification and permission of instructor*

Graduate student experience in the agricultural and biosystems engineering departmental teaching programs.

**A B E 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq: Permission of department chair, graduate classification*

One semester and one summer maximum per academic year professional work period.

**A B E 699: Research**

Cr. arr. Repeatable.

Research.

**A B E 699B: Research: Biosystems Engineering**

Cr. arr. Repeatable.

Guided graduate research in biosystems engineering.

**A B E 699C: Research: Computer Aided Design**

Cr. arr. Repeatable.

Guided graduate research in computer-aided design.

**A B E 699E: Research: Environmental Systems**

Cr. arr. Repeatable.

Guided graduate research in environmental systems.

**A B E 699F: Research: Food Engineering**

Cr. arr. Repeatable.

Guided graduate research in food engineering.

**A B E 699O: Research: Occupational Safety**

Cr. arr. Repeatable.

Guided graduate research in occupational safety.

**A B E 699P: Research: Power and Machinery Engineering**

Cr. arr. Repeatable.

Guided graduate research in power and machinery engineering.

**A B E 699Q: Research: Structures**

Cr. arr. Repeatable.

Guided graduate research in structures.

**A B E 699R: Research: Process Engineering**

Cr. arr. Repeatable.

Guided graduate research in process engineering.

**A B E 699S: Research: Environment and Natural Resources**

Cr. arr. Repeatable.

Guided graduate research in environment and natural resources.

**A B E 699U: Research: Waste Management**

Cr. arr. Repeatable.

Guided graduate research in waste management.

## Agricultural Education and Studies (AGEDS)

*Any experimental courses offered by AGEDS can be found at:*[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) ([http://](http://registrar.iastate.edu/faculty-staff/courses/explisting/)[www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/))**Courses primarily for undergraduates:****AGEDS 110: Professional Development in Agricultural Education and Studies: New Student Seminar**

(1-0) Cr. 1. F.S.

Introduction to professional and educational development within university, college, department and major. Development of Resumes and Cover Letters. Career planning and assessment of professional goals.

**AGEDS 111: Dean's Leadership Seminar**

(1-0) Cr. 1. F.

*Prereq: College Permission*

Introduction to leadership in agriculture and the life sciences, problem solving applied to current case studies, global perspective required by leaders, and designing programs to respond to societal needs in the agricultural and life sciences.

**AGEDS 112: Agriculture Biotechnology Colloquium**

(1-0) Cr. 1. S.

*Prereq: Department Permission*

The scientific basis of biological and social sciences in agriculture.

**AGEDS 113: Access to Success Seminar I**

Cr. 1. Repeatable. F.S.

Career skills, learning strategies, and social and academic integration techniques to student members of Step Forward Learning Community. Utilization of campus resources, encouragement of self-exploration, and development of academic skills. Offered on a satisfactory-fail basis only.

**AGEDS 116: Initial Field Experience in Agricultural Education**

(1-2) Cr. 1. F.

*Prereq: AGLSE major*

Field experience in a formal education setting designed to explore teaching as a career through guided observation and interviews, reflection, and on-campus dialogue.

**AGEDS 211: Early Field Based Experience**

(1-0) Cr. 1. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: AGEDS 110*

Forty hours on-site in an agricultural setting. Students will have an opportunity outside the classroom for career guidance, role modeling, and reflection on their observations that they can apply to their courses and other educational experiences.

**AGEDS 211A: High School Agriculture Programs**

(1-0) Cr. 1. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: AGEDS 110*

Forty hours on-site in an agricultural setting. Students will have an opportunity outside the classroom for career guidance, role modeling, and reflection on their observations that they can apply to their courses and other educational experiences.

**AGEDS 211C: Agricultural Industries and Agencies**

(1-0) Cr. 1. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: AGEDS 110*

Forty hours on-site in an agricultural setting. Students will have an opportunity outside the classroom for career guidance, role modeling, and reflection on their observations that they can apply to their courses and other educational experiences.



**AGEDS 215: Professional Development in Agricultural Education and Studies: Career Seminar**

(1-0) Cr. 1. F.S.

*Prereq:* Credit or concurrent enrollment in AGEDS 110; Junior classification  
Career preparation including assessments, networking, interviewing skills and related life skill development. Survey of current issues in agriculture that impact career goals.

**AGEDS 310: Foundations of Agricultural Education Programs**

(3-0) Cr. 3. F.S.

*Prereq:* Sophomore classification

Historical development of agricultural education programs. Philosophic premises, program goals and objectives. Educational and social issues impacting the implementation of agricultural education programs.

**AGEDS 311: Presentation and Sales Strategies for Agricultural Audiences**

(3-0) Cr. 3. F.S.

Utilizing instructional methods, techniques, and problem solving, presentation and sales strategies with agricultural audiences.

**AGEDS 312: Science With Practice**

(1-6) Cr. 3. Repeatable. F.S.

*Prereq:* College of Agriculture and Life Sciences undergraduate majors

A planned learning experience wherein each student and faculty mentor develops a learning agreement that encompasses specific activities and expectations. Students are engaged in reflective activities that include journals, micro-reflections, formal presentations, and a comprehensive portfolio.

**AGEDS 315: Personal, Professional, and Entrepreneurial Leadership in Agriculture**

(3-0) Cr. 3. F.S.

*Prereq:* Sophomore classification

Leadership principles and strategies to influence and motivate team members to achieve personal, professional, and entrepreneurial goals in production agriculture, agricultural education, and agricultural organizations.

**AGEDS 327: Survey of Agriculture and Life Sciences Communication**

(3-0) Cr. 3. F.S.

*Prereq:* ENGL 250

Development of written, oral, visual and electronic communications relevant to agriculture and life sciences. Students develop a set of communication skills applicable to agriculture and life science contexts and for various audiences.

**AGEDS 388: Agricultural Mechanics Applications**

(2-3) Cr. 3. F.S.SS.

Introduction to SMAW (Arc), GMAW (Mig), GTAW (Tig), Oxy-Fuel welding, Oxy-Fuel cutting, and Plasma cutting theories and applications. Emphasis will be on theoretical foundation of welding, safety, welding skill development, and management of equipment, and materials. Introduction to small engines and applications. Emphasis will be on theory of operating systems, maintenance, troubleshooting, failure analysis, and safety.

**AGEDS 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq:* Department Permission

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**AGEDS 401: Planning Agriculture and Life Sciences Education Programs**

(Dual-listed with AGEDS 501). (3-0) Cr. 3. F.

*Prereq:* AGEDS 310

Responsibilities of an agricultural education teacher, curriculum development, experiential learning opportunities including FFA and SAE, and assessment and maintenance of program quality.

**AGEDS 402: Methods of Teaching in Agriculture and Life Sciences**

(Dual-listed with AGEDS 502). (3-0) Cr. 3. F.

*Prereq:* AGEDS 401; concurrent enrollment in AGEDS 311

Topics include: principles of teaching and learning, individualized and group methods, application of learning, instructional management, special populations, and evaluation.

**AGEDS 412: Internship in Agricultural Education and Studies**

Cr. 2-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Junior classification in AGEDS; Permission of Instructor

A supervised two to twelve week learning experience in an approved learning setting with application to educational, agricultural, communications and/or environmental practices and principles.

**AGEDS 414: Developing Agricultural Education Programs in Non-Formal Settings**

(2-0) Cr. 2. S.

Basic concepts in planning, conducting, and evaluating educational programs in non-formal settings. Includes programming for youth and adults in Extension, agricultural industry, and related agencies.

**AGEDS 416: Pre-Student Teaching Experience in Agricultural Education**

Cr. 1. F.S.

*Prereq:* AGEDS 211; AGEDS 402; Admission to teacher education program

A forty hour field-based experience in an approved secondary agricultural education program. Concurrent enrollment in 417 is required.

**AGEDS 417: Supervised Teaching in Agriculture and Life Sciences**

Cr. 1-16. Repeatable. F.S.

*Prereq: AGEDS 211; AGEDS 402; Admission to teacher education program*  
Supervised teaching in public schools.

**AGEDS 425: Curriculum for Agricultural Science Education**

(Dual-listed with AGEDS 525). Cr. 1-6. Repeatable, maximum of 3 times. SS.

Inquiry-based techniques for education related to science, technology, engineering, and mathematics (STEM) in agriculture in secondary classrooms. Analyze, demonstrate, and design activities, labs, and projects using inquiry-based frameworks for teaching and learning.

**AGEDS 450: Farm Management and Operation**

(2-4) Cr. 3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ECON 230; ECON 235; Junior classification*

Participation in the management and operation of a diversified Iowa farm. The class is responsible for the plans, records, and decisions for buying and selling the farm's livestock, crops, and equipment. Special speakers on current topics. May be taken for credit 3 times at different times of the year with permission of the instructor.

**AGEDS 451: Agricultural Law**

(3-0) Cr. 3. S.

*Prereq: Senior classification*

The legal framework impinging upon decision-making by firms, families, and individuals, real and personal property, contracts, secured transactions, negotiable instruments, debtor-creditor relations, bankruptcy, farm income tax organization of firms, intergenerational property transfers, trusts and farm estate planning, civil and criminal liabilities, environmental law, federal and state regulatory powers.

**AGEDS 461: Innovation Diffusion and the Role of Agricultural and Extension Education**

(Dual-listed with AGEDS 561). (3-0) Cr. 3. F.

*Prereq: Junior classification*

Examine the processes by which innovations in agriculture, food, and natural resources are diffused across global societies based on their performance characteristics that influence rate of adoption. Diffusion of Innovations Theory and alternative models will be applied to analyze and solve issues facing communities, industries, and organizations in domestic and international settings.

Meets International Perspectives Requirement.

**AGEDS 475: Agri-Marketing and Communications Competition**

(2-0) Cr. 1-2. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Specialized training in communication and agricultural marketing knowledge and skills in preparation for intercollegiate competition. Maximum of 6 credits can be applied toward graduation.

**AGEDS 488: Methods of Teaching Agricultural Mechanics**

(2-3) Cr. 3. F.S.

*Prereq: AGEDS 388; credit or concurrent enrollment in AGEDS 310*

Methods and management techniques in agricultural mechanics laboratories. Emphasis will be on safety, mechanical skills development and management of students, facilities, equipment, and materials.

**AGEDS 490: Independent Study in Agricultural Education and Studies**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490A: Philosophy, Curriculum, and Methods**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490B: Leadership, Evaluation, and Administration**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490C: Business, Industry, and Production Agriculture**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490D: Extension and International Agriculture**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490E: Instructional Technology**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490F: Environmental Issues**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490G: Entrepreneurship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490H: Independent Study in Agricultural Education and Studies, Honors**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor***AGEDS 490I: Communications**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

**AGEDS 496: Agricultural Travel Course**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study agriculture and education related topics. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**AGEDS 496A: International**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study agriculture and education related topics. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

Meets International Perspectives Requirement.

**AGEDS 496B: Domestic**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study agriculture and education related topics. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**AGEDS 499: Undergraduate Research**

Cr. arr. F.S.SS.

*Prereq: Department Permission*

Research experience in agricultural education and studies with application to selected problems.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AGEDS 501: Planning Agriculture and Life Sciences Education Programs**

(Dual-listed with AGEDS 401). (3-0) Cr. 3. F.

*Prereq: AGEDS 310*

Responsibilities of an agricultural education teacher, curriculum development, experiential learning opportunities including FFA and SAE, and assessment and maintenance of program quality.

**AGEDS 502: Methods of Teaching in Agriculture and Life Sciences**

(Dual-listed with AGEDS 402). (3-0) Cr. 3. F.

*Prereq: AGEDS 401; concurrent enrollment in AGEDS 311*

Topics include: principles of teaching and learning, individualized and group methods, application of learning, instructional management, special populations, and evaluation.

**AGEDS 510: Introduction to Research in Agricultural Education**

(3-0) Cr. 3. S.

*Prereq: Graduate classification*

Determining your research focus; developing research problems and objectives; reviewing the literature and establishing a theoretical framework; establishing procedures for data collection and analysis; ethical issues.

**AGEDS 511: Professional Agricultural Presentation Practices**

(3-0) Cr. 3. F.SS.

*Prereq: Graduate Classification*

The identification and use of key planning, delivery and evaluation of presentations using audience engagement techniques focused on research-based principles and field-based practices of professional presenters in agriculture and the life sciences.

**AGEDS 517: Student Teacher Education Practicum**

Cr. 2-6. F.S.

*Prereq: AGEDS 590B, AGEDS 501, AGEDS 502 Admission to the University Teacher Education program*

Supervised 5th-12th grade public and private schools teaching practicum for graduate students in Masters degree teacher certification program. NA

**AGEDS 520: Instructional Methods for Adult and Higher Education in Agriculture and Natural Resources**

(3-0) Cr. 3. S.

*Prereq: Graduate classification*

Theory and practice of adult education. Teaching and learning in formal and non-formal instructional programs for adult learners.

**AGEDS 524: Program Development and Evaluation in Agricultural and Extension Education**

(3-0) Cr. 3. F.

*Prereq: Graduate classification*

Theories and practice of program planning for nonformal education. Addresses use of program logic modeling and considers critical theories of planning to address power and interests in program development, needs assessment, and evaluation.

**AGEDS 525: Curriculum for Agricultural Science Education**

(Dual-listed with AGEDS 425). Cr. 1-6. Repeatable, maximum of 3 times. SS.

Inquiry-based techniques for education related to science, technology, engineering, and mathematics (STEM) in agriculture in secondary classrooms. Analyze, demonstrate, and design activities, labs, and projects using inquiry-based frameworks for teaching and learning.

**AGEDS 533: Introduction to Learning Theory in Agricultural Education**

(3-0) Cr. 3. S.

*Prereq: Graduate classification*

Introduction to a variety of theoretical perspectives of learning and how they may be used within the context of agricultural education. Emphasis will be on the major domains of learning, developmental considerations, basic assumptions, concepts, and principles of various learning theories; understanding how each theoretical perspective may be used in both formal and non-formal educational settings.

**AGEDS 550: Foundations of Agricultural Education**

(3-0) Cr. 3. F.

*Prereq: Graduate classification*

Philosophical premises, ethical principles, historical development, contextual applications, and knowledge bases for agricultural education.

**AGEDS 561: Innovation Diffusion and the Role of Agricultural and Extension Education**

(Dual-listed with AGEDS 461). (3-0) Cr. 3. F.

*Prereq: Junior classification*

Examine the processes by which innovations in agriculture, food, and natural resources are diffused across global societies based on their performance characteristics that influence rate of adoption. Diffusion of Innovations Theory and alternative models will be applied to analyze and solve issues facing communities, industries, and organizations in domestic and international settings.

Meets International Perspectives Requirement.

**AGEDS 568: Qualitative Interviews and Focus Groups**

(3-0) Cr. 3. S.

*Prereq: Graduate Status*

Understanding the role of interviews in agricultural education research, basis for theory of meaning, and variations of interview technique among qualitative traditions. Development of facilitation technique for individual interviews; and focus groups. Transcription and basic qualitative analysis. Use of interview findings to prepare manuscripts.

**AGEDS 590: Special Topics in Agricultural Education**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590A: Curriculum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590B: Methods**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590C: Philosophy**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590D: Evaluation**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590E: Administration**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590F: Leadership**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590G: Guidance**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590I: Instructional Technology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590J: Extension**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590K: International Agriculture**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 590L: Program Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 593: Workshop in Agricultural Education**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 593A: Curriculum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 593B: Methods**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 593C: Evaluation**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education*

**AGEDS 593D: Administration**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 593E: Leadership**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 593F: Extension**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 593G: Program Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 593H: Instructional Technology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 593M: Biotechnology Workshop**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 12 credits in agricultural education***AGEDS 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

For nonthesis masters degree programs.

**Courses for graduate students:****AGEDS 615: Seminar in Agricultural Education**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 615A: Writing for publication**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 615B: Ethics**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 615C: Grant writing**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 615D: Career planning**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 615E: Contemporary issues**

(1-0) Cr. 1. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

**AGEDS 617: Professional Internship for Agricultural Educators**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of instructor*

Analysis of the roles and activities of professionals in agricultural education. Supervised professional field-based experience in public and private settings. Offered on a satisfactory-fail basis only.

**AGEDS 625: Leadership, Administration, Supervision and Management of Agricultural Education Programs**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Principles and best practices for leading, administering, supervising, and managing agricultural education programs. Analyzing selected case studies that apply theory to practice in agricultural situations.

**AGEDS 699: Research**

Cr. arr. Repeatable.

## Agronomy (AGRON)

*Any experimental courses offered by AGRON can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****AGRON 105: Leadership Experience**

Cr. R.

A participatory experience in activities or completion of a course that enhances the development of leadership and group-dynamic skills. See advisor for departmental requirements.

**AGRON 110: Professional Development in Agronomy: Orientation**

Cr. 1. F.

Orientation to college life, the profession of agronomy, and the agronomy curriculum.

**AGRON 120: Introduction to Renewable Resources**

(Cross-listed with ENV S, NREM). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**AGRON 140: Climate and Society**

(Cross-listed with ENV S, GEOL, MTEOR). Cr. 3. F.S.

The climate system of our planet. How nature and our actions alter the existing energy balance leading to climate change. Past climates on our planet. The influence of climate on society and resource availability during the Holocene (~ 11,000 years ago to present) with focus on changes post industrial revolution. Significant climate events that have altered our way of life in the past. Projected changes in future climate and potential impacts on society, environment and resources. Adaption to and mitigation of climate change.

Meets International Perspectives Requirement.

**AGRON 160: Water Resources of the World**

(Cross-listed with ENV S, GEOL, MTEOR). (3-0) Cr. 3. S.

Study of the occurrence, history, development, and management of world water resources. Basic hydrologic principles including climate, surface water, groundwater, and water quality. Historical and current perspectives on water policy, use, and the role of water in society and the environment. Meets International Perspectives Requirement.

**AGRON 180: Global Agriculture in a Changing World**

(3-0) Cr. 3. F.

A scientific investigation of the global distribution of climate, soils and agricultural production and consumption. Physical processes that connect natural resources to agriculture and the environment. How global change drives increasing demand for agricultural production.

Meets International Perspectives Requirement.

**AGRON 181: Introduction to Crop Science**

(3-0) Cr. 3. F.S.

Basic structure and function of plants, origin and classification, growth and development. Fundamentals of photosynthesis, plant water use, plant nutrition and genetics that regulate plant growth, development and responses to the environment.

**AGRON 182: Introduction to Soil Science**

(3-0) Cr. 3. F.S.

*Prereq: CHEM 163*

Introduction to physical, chemical, and biological properties of soils; soil formation, classification and global distribution; soil health, soils and humanity and sustainable land management.

**AGRON 183: Basic Skills for Agronomists**

(0-3) Cr. 1. F.

Developing the skills that agronomists employ in their work with crops, soil, and the environment through activities involving tools and methodologies used by agronomists. Enrollment is restricted to first-year students majoring in agronomy.

**AGRON 206: Introduction to Weather and Climate**

(Cross-listed with MTEOR). (3-0) Cr. 3. F.S.

Basic concepts in weather and climate, including atmospheric measurements, radiation, stability, precipitation, winds, fronts, forecasting, and severe weather. Applied topics include global warming, ozone depletion, world climates and weather safety.

**AGRON 210: Professional Development in Agronomy: Career Planning**

(1-0) Cr. 1. F.S.

Career planning, résumé and cover letter preparation.

**AGRON 217: Weed Identification**

(1-2) Cr. 1. F.S.

*Prereq: 3 credits of BIOL*

Half-semester course. Identification of important weeds of agricultural, horticultural and native habitats. Principles of plant taxonomy and classification. Field trips.

**AGRON 250: Environmental Geography**

(Cross-listed with ENSCI, ENV S, NREM). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

**AGRON 259: Organic Compounds in Plants and Soils**

(3-0) Cr. 3. S.

*Prereq: (AGRON 182 or GEOL 210 or ENSCI 250); BIOL 212; (CHEM 163 or CHEM 177); MATH 140*

Structure, function, and transformations of organic compounds significant in plant and soil environments.

**AGRON 270: Geospatial Technologies**

(Cross-listed with ENSCI). Cr. 3. S.

Concepts and tools for acquiring, managing, analyzing, and displaying geographic information, including GIS, remote sensing, spatial analysis, and cartography. Focus on applications in biological, ecological, environmental, and agricultural sciences.

**AGRON 279: Field Exploration of Agronomy**

(2-3) Cr. 3. F.

*Prereq: AGRON 181; AGRON 182*

Field-based investigation of Iowa's agronomic systems. Application of principles learned in introductory soils, crops and agronomy courses. For students majoring in agronomy.

**AGRON 280: Crop Development, Production and Management**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181; AGRON 182*

Overview of crops and cropping systems in the context of global and US agriculture. Focus on agronomic principles, constraints and opportunities as they apply to various locations in Iowa, the USA and the world.



**AGRON 281: Crop Physiology**

(3-0) Cr. 3. S.

*Prereq: AGRON 181*

Science governing plant growth and development in the context of cropping and genetic improvements.

**AGRON 282: Soil Conservation and Land Use**

(3-0) Cr. 3. F.S.

Principles of soil conservation and land use with emphasis on best management practices and use of soil maps and databases such as Web Soil Survey. AGRON 182 recommended.

**AGRON 283: Pesticide Application Certification**

(Cross-listed with ENT, FOR, HORT). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**AGRON 298: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

Students register for this course in order to retain full-time status while on a professional work experience. Students must register for this course prior to commencing each work period. Offered on a satisfactory-fail basis only.

**AGRON 310: Professional Development in Agronomy: Work Experience**

Cr. R.

Professional work experience in agronomy. See advisor for departmental requirements.

**AGRON 311: Professional Internship in Agronomy**

(1-0) Cr. 1. F.

*Prereq: Advisor Permission*

A supervised learning experience in a professional setting related to crop production, plant breeding, soil science or environmental science. For students majoring in Agronomy.

**AGRON 316: Crop Structure-Function Relationships**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181; 3 credits of BIOL*

Basic principles concerning the growth, development, and production of crop communities in relation to their environment.

**AGRON 317: Principles of Weed Science**

(3-0) Cr. 3. F.

Biology and ecology of weeds. Interactions between weeds and crops. Principles and practices of integrated weed management systems. Herbicide mechanisms, classification, and fate in plants and soils.

**AGRON 318: Introduction to Ecosystems**

(Cross-listed with BIOL, ENSCI, NREM). (3-0) Cr. 3. S.

*Prereq: 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**AGRON 320: Genetics, Agriculture and Biotechnology**

(Cross-listed with GEN). (3-0) Cr. 3. F.S.

*Prereq: BIOL 212*

Transmission and molecular genetics with an emphasis on applications in agriculture, the structure and expression of the gene, how genes behave in populations and how recombinant DNA technology can be used to improve agriculture. Credit for graduation will not be allowed for more than one of the following: Gen 260, 313, 320 and Biol 313 and 313L.

**AGRON 331: Crops Practicum**

(0-6) Cr. 2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Identification of crops, weeds and diseases of agronomic importance. Diagnostic skills related to seed purity, grain grading, herbicide injury, nutrient deficiency, insect injury, disease symptoms, and/or abiotic environmental stress. Students may participate in intercollegiate judging contests.

**AGRON 334: Forage Crop Management**

(3-0) Cr. 3. S.

*Prereq: AGRON 181*

Production and management of forage crops; concepts applied to yield, quality, and stand persistence; systems of forage utilization including grazing, hay, and silage.

**AGRON 338: Seed Science and Technology**

(Cross-listed with HORT). (2-3) Cr. 3. F.

*Prereq: (AGRON 181 or HORT 221); 3 credits of BIOL*

Seed production, maturation, dormancy, vigor, deterioration, and related aspects of enhancement, conditioning, storage, and quality evaluation. Aspects of the seed industry and regulation of seed marketing.

**AGRON 342: World Food Issues: Past and Present**

(Cross-listed with ENV S, FS HN). (3-0) Cr. 3. F.S.SS.

*Prereq: Junior classification*

Issues associated with global agricultural and food systems including ethical, social, economic, environmental, and policy contexts. Investigation of various causes and consequences of overnutrition/ undernutrition, global health, poverty, hunger, access, and distribution. Meets International Perspectives Requirement.

**AGRON 351: Turfgrass Establishment and Management**

(Cross-listed with HORT). (3-0) Cr. 3. F.

*Prereq: AGRON 181 or BIOL 211 or HORT 221*

Principles and practices of turfgrass propagation, establishment, and management. Specialized practices relative to professional lawn care, golf courses, athletic fields, highway roadsides, and seed and sod production. The biology and control of turfgrass pests.

**AGRON 351L: Turfgrass Establishment and Management Laboratory**

(Cross-listed with HORT). (0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in HORT 351*

Those enrolled in the horticulture curriculum are required to take 351L in conjunction with 351 except by permission of the instructor.

**AGRON 354: Soils and Plant Growth**

(Cross-listed with HORT). (3-0) Cr. 3. F.S.

*Prereq: AGRON 182; 3 credits of BIOL*

Effects of chemical, physical, and biological properties of soils on plant growth, with emphasis on nutritive elements, pH, organic matter maintenance, and rooting development.

**AGRON 354L: Soils and Plant Growth Laboratory**

(Cross-listed with HORT). (0-3) Cr. 1. F.S.

*Prereq: AGRON or HORT major; credit or concurrent enrollment in AGRON 354*

Laboratory exercises in soil testing that assess a soil's ability to support nutritive requirements for plant growth.

**AGRON 360: Environmental Soil Science**

(Cross-listed with ENSCI). (3-0) Cr. 3. S.

Application of soil science to contemporary environmental problems; comparison of the impacts that different management strategies have on short- and long-term environmental quality and land development. Emphasis on participatory learning activities. AGRON 182 or ENSCI 250 or GEOL 101 recommended.

**AGRON 370: Field Experience in Soil Description and Interpretation**

(0-3) Cr. 1. Repeatable, maximum of 4 times. F.S.

*Prereq: Credit or concurrent enrollment in AGRON 182*

Description and interpretation of soils in the field and laboratory, emphasizing hands-on experience. Evaluation of soil information for land use. Students may participate in intercollegiate judging contests.

**AGRON 392: Systems Analysis in Crop and Soil Management**

(2-3) Cr. 3. F.S.

*Prereq: AGRON 316; AGRON 354*

Management strategies at the level of the farm field. Emphasis will be on participatory learning activities.

**AGRON 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor; Junior classification*

Student register for this course in order to retain full-time status while on a professional work experience. The student must register for this course prior to commencing each work period. Offered on a satisfactory-fail basis only.

**AGRON 404: Global Change**

(Dual-listed with AGRON 504). (Cross-listed with ENSCI, ENV S, MTEOR).

(3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**AGRON 405: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with AGRON 505). (Cross-listed with ENSCI, MTEOR). (3-0) Cr.

3. Alt. S., offered odd-numbered years.

*Prereq: MATH 160 or MATH 165*

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**AGRON 406: World Climates**

(Cross-listed with ENSCI, MTEOR). (3-0) Cr. 3. S.

*Prereq: AGRON 206 or MTEOR 206*

Distribution and causes of different climates around the world. Effects of climate and climate variations on human activities including society, economy and agriculture. Current issues such as climate change and international efforts to assess and mitigate the consequences of a changing climate. Semester project and in-class presentation required. Meets International Perspectives Requirement.

**AGRON 407: Mesoscale Meteorology**

(Dual-listed with AGRON 507). (Cross-listed with MTEOR). (3-0) Cr. 3. Alt.

S., offered even-numbered years.

*Prereq: MATH 166; MTEOR 443*

Physical nature and practical consequences of mesoscale atmospheric phenomena. Mesoscale convective systems, fronts, terrain-forced circulations. Observation, analysis, and prediction of mesoscale atmospheric structure.

**AGRON 410: Professional Development in Agronomy: Senior Forum**  
(1-0) Cr. 1. F.S.*Prereq: AGRON 210; Senior classification*

Development of an appropriate content for professionalism. Topics include professional certification, ethics, and maintaining an active network of information sources and professional contacts in support of lifelong learning. Student interpretation, writings, presentations, and discussions.

**AGRON 421: Introduction to Plant Breeding**

(Cross-listed with HORT). (3-0) Cr. 3. F.

*Prereq: BIOL 313 or GEN 320*

Fundamental principles of plant breeding and cultivar development, breeding methods for self-pollinated, cross-pollinated and clonal crops.

**AGRON 425: Crop and Soil Modeling**

(Dual-listed with AGRON 525). (3-0) Cr. 3. F.

*Prereq: (AGRON 316 or AGRON 354); MATH 165*

Understanding basic crop physiology and soil processes through the use of mathematical and statistical approaches. Structure of crop models, dynamics and relationship among components such as leaf-level photosynthesis, canopy architecture, root dynamics and soil carbon and nitrogen pools.

**AGRON 450: Issues in Sustainable Agriculture**

(Cross-listed with ENV S). (3-0) Cr. 3. S.

Agricultural science as a human activity; contemporary agricultural issues from agroecological perspective. Comparative analysis of intended and actual consequences of development of industrial agricultural practices.

**AGRON 452: Intro GIS for Geoscientists**

(Dual-listed with AGRON 552). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**AGRON 459: Environmental Soil and Water Chemistry**

(Dual-listed with AGRON 559). (Cross-listed with ENSCI). (3-3) Cr. 4. F.

*Prereq: 6 credit of CHEM; (AGRON 182 or AGRON 360); MATH 140*

An introduction to the chemical properties of soils, chemical reactions and transformations in soils and surface waters, and their impact on the environment. Topics include solution chemistry in soils and surface waters, solid-phase composition of soils, reactions at the solid-solution interface, and applications to contemporary environmental issues. AGRON 354; GEOL 100 recommended.

**AGRON 463: Soil Formation and Landscape Relationships**

(Dual-listed with AGRON 563). (Cross-listed with ENSCI). (3-0) Cr. 3. F. Relationships between soil formation, geomorphology, and environment. Soil description, classification, geography, mapping, and interpretation for land use. Two weekend field trips. AGRON 182 or ENSCI 250 recommended. Credit for one of AGRON 463 or AGRON 463I may be applied for graduation.

**AGRON 477: Soil Physics**

(Dual-listed with AGRON 577). (Cross-listed with ENSCI). (3-0) Cr. 3. S.

The physical soil system: the soil components and their physical interactions; transport processes involving water, air, and heat. AGRON 182 recommended.

**AGRON 484: Organic Agricultural Theory and Practice**

(Dual-listed with AGRON 584). (Cross-listed with HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in biological or physical sciences*

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

**AGRON 485: Soil and Environmental Microbiology**

(Dual-listed with AGRON 585). (Cross-listed with ENSCI, MICRO). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**AGRON 488: Raster GIS for Geoscientists**

(Dual-listed with AGRON 588). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**AGRON 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected studies in crops, soils, or agricultural meteorology according to the needs and interests of the student.

**AGRON 490E: Independent Study: Entrepreneurship**

Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected studies in crops, soils, or agricultural meteorology according to the needs and interests of the student.

**AGRON 490G: Independent Study: General**

Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected studies in crops, soils, or agricultural meteorology according to the needs and interests of the student.

**AGRON 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected studies in crops, soils, or agricultural meteorology according to the needs and interests of the student.

**AGRON 490Z: Independent Study: Service Learning**

Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected studies in crops, soils, or agricultural meteorology according to the needs and interests of the student.

**AGRON 491: Seed Science Internship Experience**

(Cross-listed with HORT). Cr. 1-2. Repeatable, maximum of 1 times. F.S.SS.

*Prereq: AGRON 338; Permission of Instructor*

A professional work experience and creative project for seed science secondary majors. The project requires the prior approval and participation of the employer and instructor. The student must submit a written report. Advanced approval and participation of employer and instructor required.

**AGRON 493: Workshop in Agronomy**

Cr. arr. Repeatable, maximum of 4 times.

*Prereq: Permission of Instructor*

Workshop experience in crops, soils, or agricultural meteorology.

**AGRON 496: Agricultural Travel Course**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. Tour and study of production methods in major crop and livestock regions of the world. Influence of climate, economics, geography, soils, landscapes, markets, and other factors on crop and livestock production. Location and duration of tours will vary. Tour expenses paid by students. Check with department for current offerings.

**AGRON 496A: International Tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. Tour and study of production methods in major crop and livestock regions of the world. Influence of climate, economics, geography, soils, landscapes, markets, and other factors on crop and livestock production. Location and duration of tours will vary. Tour expenses paid by students. Check with department for current offerings. Meets International Perspectives Requirement.

**AGRON 496B: Domestic Tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. Tour and study of production methods in major crop and livestock regions of the world. Influence of climate, economics, geography, soils, landscapes, markets, and other factors on crop and livestock production. Location and duration of tours will vary. Tour expenses paid by students. Check with department for current offerings.

**AGRON 497: Agroecology Field Course**

(3-0) Cr. 3. F.

*Prereq: Junior or Senior classification; 8 credits in AGRON*

A one-week intensive class, offered off-campus. Student will visit farms within the Midwest and analyze the sustainability of each farm.

**AGRON 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor; Senior classification*

Students register for this course in order to retain full-time status while on a professional work experience. Students must register for this course prior to commencing each work period. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AGRON 500: Orientation Seminar**

(2-0) Cr. 1. F.

*Prereq: Agronomy graduate students only*

An introduction to Iowa and U.S. agriculture for scholars in agronomic majors. Field trips when possible. Departmental role in the functioning of research, teaching, and extension in fulfilling the charge given the land-grant university.

**AGRON 501: Crop Growth and Development**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, MATH 140, CHEM 163, BIOL 101*

Physiological processes in crop growth, development and yield: photosynthesis, respiration, water relations, mineral nutrition, assimilate partitioning, seedling vigor, light interception and canopy growth, root growth, reproduction and yield.

**AGRON 502: Chemistry, Physics, and Biology of Soils**

(3-0) Cr. 3. F.Alt. S., offered odd-numbered years.

*Prereq: AGRON 181 or equivalent, AGRON 182 or equivalent, BIOL 101, CHEM 163, MATH 140*

Soil chemical, physical, and biological properties that control processes within the soil, their influence on plant/soil interactions, and soil classification. Basic concepts in soil science and their applications.

**AGRON 503: Climate and Crop Growth**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent and MATH 140*

Applied concepts in climate and agricultural meteorology with emphasis on the climate-agriculture relationship and the microclimate-agriculture interaction and crop risk management. Basic meteorological principles are also presented to support these applied concepts.

**AGRON 504: Global Change**

(Dual-listed with AGRON 404). (Cross-listed with ENSCI, MTEOR). (3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**AGRON 505: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with AGRON 405). (Cross-listed with ENSCI, MTEOR). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MATH 160 or MATH 165*

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**AGRON 506: Crop Genetics**

(Cross-listed with HORT). Cr. 3. F.

Introduction to plant reproductive systems, gene segregation and linkage analysis, molecular nature of genes and how genes confer phenotypes, mutation and biotechnology, quantitative inheritance and population genetics to prepare students for subsequent courses in crop improvement. Enrollment is restricted to off-campus MS in Plant Breeding students.

**AGRON 507: Mesoscale Meteorology**

(Dual-listed with AGRON 407). (Cross-listed with MTEOR). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MATH 166; MTEOR 443*

Physical nature and practical consequences of mesoscale atmospheric phenomena. Mesoscale convective systems, fronts, terrain-forced circulations. Observation, analysis, and prediction of mesoscale atmospheric structure.

**AGRON 508: Biophysical Crop Ecology**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

The physics behind how humans use plant photosynthesis to convert energy from the sun into useful products. Techniques for quantifying and predicting ecological interactions in the soil-plant-atmosphere continuum.

**AGRON 509: Agroecosystems Analysis**

(Cross-listed with SOC, SUSAG). (3-4) Cr. 4. F.

*Prereq: Senior or above classification; permission of instructor*

Experiential, interdisciplinary examination of Midwestern agricultural and food systems, emphasizing both field visits and classroom activities. Focus on understanding multiple elements, perspectives (agronomic, economic, ecological, social, etc.), and scales of operation.

**AGRON 510: Crop Improvement**

(Cross-listed with STB). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

A study of agriculture from its origins with the domestication of crop plants through basic genetics, demonstrating the challenges and elements of breeding strategies intended to manage gene x environmental interactions. Elements of biotechnology including use of molecular markers, development of genetically modified cultivars, gene mapping, cloning, and gene editing will be covered. Methods to measure the effectiveness of plant breeding (genetic gain) and the impact of improved agronomic practices contributing to increased agricultural productivity will be covered. Use of intellectual property protection, and the conservation and utilization of exotic genetic resources.

**AGRON 511: Crop Improvement**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, MATH 140, CHEM 163, BIOL 101*

Basic principles in the genetic improvement of crop plants. Methods of cultivar development in self-pollinated and cross-pollinated crop species.

**AGRON 512: Soil-Plant Environment**

(3-0) Cr. 3. S.

*Prereq: AGRON 502. Recommended AGRON 501*

Soil properties and their impact on soil/plant relationships. Soil structure, aeration, moisture, and nutrients will be discussed in the context of soil fertility and environmental quality management.

**AGRON 513: Data Science for Agricultural Professionals**

(Cross-listed with STB). (3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, MATH 140, STAT 104*

Quantitative methods for analyzing and interpreting agronomic information. Principles of experimental design, hypothesis testing, analysis of variance, regression, correlation, and graphical representation of data. Use of SAS and Excel for organization, analyzing, and presenting data.

**AGRON 514: Integrated Pest Management**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, AGRON 501, MATH 140, CHEM 163, BIOL 101; AGRON 502 and AGRON 503 recommended*

Principles and practices of weed science, entomology, and plant pathology applied to crop production systems. Biology, ecology and principles of integrated crop pest management.

**AGRON 515: Integrated Crop and Livestock Production Systems**

(Cross-listed with A B E, AN S, SUSAG). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SUSAG 509*

Methods to maintain productivity and minimize the negative ecological effects of agricultural systems by understanding nutrient cycles, managing manure and crop residue, and utilizing multispecies interactions. Crop and livestock production within landscapes and watersheds is also considered. Course includes a significant field component, with student teams analyzing Iowa farms.

**AGRON 516: Crop Physiology**

(3-0) Cr. 3. S.

Investigation of Molecular, whole plant, and plant community processes essential to biomass production and seed formation, and analysis of molecular approaches to overcome the limitations imposed on these processes by the environment.

**AGRON 518: Microwave Remote Sensing**

(Cross-listed with E E, MTEOR). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Math 265*

Microwave remote sensing of Earth's surface and atmosphere using satellite-based or ground-based instruments. Specific examples include remote sensing of atmospheric temperature and water vapor, precipitation, ocean salinity, and soil moisture.

**AGRON 519: Herbicide Physiology and Biochemistry**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: AGRON 316 (or equivalent) and AGRON 317*

Herbicide mechanisms of action, selectivity, uptake, and translocation. Specific sites of herbicide action as they affect plant physiology. Herbicide resistance in weeds and crops. Implications of herbicides on weed management.

**AGRON 520: Plant Breeding Methods**

Cr. 3. F.

*Prereq: AGRON 506*

Breeding methods used in the genetic improvement of self-pollinated, cross-pollinated and clonal crops.

**AGRON 521: Principles of Cultivar Development**

(3-0) Cr. 3. S.

*Prereq: AGRON 421 and STAT 401*

Theoretical and practical exploration of breeding methods to develop clonal, pureline, inbred and hybrid cultivars. Principles and strategies to set breeding objectives, parental selection and germplasm management, population development, generation advancements, multiple trait selection, experimental designs in breeding programs; seed production and certification. Introduce tools available to a breeder.

**AGRON 522: Field Methods in Plant Breeding**

(0-6) Cr. 1-2. Alt. SS., offered odd-numbered years.

*Prereq: AGRON 521*

Field experience in planning and conducting plant breeding research for germplasm and cultivar development. Offered on a satisfactory-fail basis only.

**AGRON 523: Molecular Plant Breeding**

(2-2) Cr. 3. S.

*Prereq: AGRON 421 or AGRON 521, GDCB 542A*

Plant breeding in the era of sequenced genomes and transformation. High throughput genomic technologies will be presented in relation to various applications in plant breeding.

**AGRON 524: Applied Plant Molecular Genetics & Biotechnology**

Cr. 3. F.

*Prereq: AGRON 506*

Basic principles and applied techniques used in the genetic improvement of crop plants. Discussion of structure and function of genes that control traits of value. Types of molecular markers, analysis of quantitatively inherited traits, genome mapping, analyses of databases.



**AGRON 525: Crop and Soil Modeling**

(Dual-listed with AGRON 425). (3-0) Cr. 3. F.

*Prereq: (AGRON 316 or AGRON 354); MATH 165*

Understanding basic crop physiology and soil processes through the use of mathematical and statistical approaches. Structure of crop models, dynamics and relationship among components such as leaf-level photosynthesis, canopy architecture, root dynamics and soil carbon and nitrogen pools.

**AGRON 526: Field Plot Technique**

(3-2) Cr. 4. S.

*Prereq: STAT 401*

Planning experiments for agricultural research, analysis of data, and concepts in data interpretation.

**AGRON 528: Quantitative Genetics for Plant Breeding**

(3-0) Cr. 3. S.

*Prereq: AGRON 506 or AGRON 513*

An introduction to the application of quantitative genetics to plant breeding programs.

**AGRON 530: Ecologically Based Pest Management Strategies**

(Cross-listed with ENT, PL P, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**AGRON 531: Crop Ecology and Management**

(3-0) Cr. 3. F.

*Prereq: AGRON 501, AGRON 502, AGRON 503; AGRON 512 and AGRON 514 recommended*

Ecological principles underlying crop production systems. Crop production in the context of management approaches, system resources and constraints, and interactions. Emphasis on the ecology of row and forage crops common to the Midwest. Required course for the Master of Science in Agronomy degree program.

**AGRON 532: Soil Management**

(3-0) Cr. 3. F.

*Prereq: AGRON 501, AGRON 503, AGRON 512. Recommended AGRON 513*

Evaluates the impact of various soil management practices on soil and water resources. Combines and applies basic information gained in Agron 502 and Agron 512. Emphasizes the agronomic, economic, and environmental effects of soil management strategies. Required course for the Master of Science in Agronomy degree program.

**AGRON 533: Crop Protection**

(3-0) Cr. 3. F.SS.

*Prereq: AGRON 514*

Integrated management systems for important crop pests. Cultural, biological and chemical management strategies applicable to major crops grown in the Midwest. Required course for the Master of Science in Agronomy degree program.

**AGRON 534: Seed and Variety, Testing and Technology**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The components of seed quality and how they are assessed in the laboratory, including traits derived from modern biotechnology. The impact of new technologies on seed quality testing. Variety maintenance procedures and breeder seed. Variety identification: phenotype and grow-out trials, isozyme testing, and DNA marker testing. Procedures for evaluating varieties. The variance tests appropriate for fixed effects analysis of variance. Statistical inference and stratification for yield trials. Use of strip plot testing.

**AGRON 536: Quantitative Methods for Seed**

(Cross-listed with STB). (2-0) Cr. 2. F.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Quantitative Methods for analyzing and interpreting agronomic and business information for the seed industry. Principles of experimental design and hypothesis testing, regression, correlation, analysis of variance, and graphical representation of data. Use of spreadsheets and statistical software for manipulating, analyzing and presenting data.

**AGRON 537: Quantitative Analytics for Plant Breeding**

Cr. 3. F.S.

*Prereq: AGRON 181, Math 140*

Methods to quantify consequences of decisions based on analytical methods used in crop genetic improvement and cultivar development.

**AGRON 538: Seed Physiology and the Environment**

(Cross-listed with HORT). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: AGRON 316; CHEM 231 or CHEM 331*

Physiological aspects of seed development, maturation, longevity, dormancy, and germination of agronomic and horticultural crops and their interactions with field and storage environments. Emphasis on current literature and advanced methodology.

**AGRON 539: Seed Conditioning and Storage**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The technical operations which may be carried out on a seed lot from harvest until it is ready for marketing and use. The opportunities for quality improvement and the risks of deterioration which are present during that time. Analysis of the costs of and benefits of operations. Evaluation of equipment based on benefits to the customer and producer. Interpretation of the role of the conditioning plant and store as a focal points within the overall operations of a seed company.

**AGRON 544: Host-Pest Interactions**

Cr. 3. S.

Incorporation of the principles of integrated pest management and crop protection. Management systems (biological, cultural, chemical) and strategies which practice principles of weed science, plant pathology, and entomology.

**AGRON 546: Strategies for Diversified Farming Systems**

(Cross-listed with HORT, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: SUSAG 509*

Project-focused engagement in food and farming systems using tools and perspectives drawn from multiple disciplines. Includes a field component.

**AGRON 547: Seed Production**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of crop production; including management of soil fertility, planting dates, populations, weed control, and insect control. Analysis of the principles of seed multiplication and the key practices which are used to ensure high quality in the products. Field inspection procedures and production aspects that differ from other crop production. Foundation seed production. Analysis of the typical organization of field production tasks. Survey of the differences in seed production strategies between crops and the impact of these differences on seed production.

**AGRON 551: Growth and Development of Perennial Grasses**

(Cross-listed with HORT). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Junior or senior or graduate classification or permission of instructor*

Selected topics on anatomy, morphology, and physiology relative to growth and development of perennial grasses. Emphasis on growth and development characteristics peculiar to grasses and variations of such characteristics under natural and managed conditions.

**AGRON 552: Intro GIS for Geoscientists**

(Dual-listed with AGRON 452). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**AGRON 553: Soil-Plant Relationships**

(Cross-listed with ENSCI). (3-0) Cr. 3. S.

Composition and properties of soils in relation to the nutrition and growth of plants.

**AGRON 554: Advanced Soil Management**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: AGRON 354; MATH 165*

Implications of soil management on the soil environment and root activity. Effect of soil physical properties on soil erosion.

**AGRON 555: Environmental Soil Mineralogy**

(Cross-listed with GEOL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AGRON 473, CHEM 178. Recommend: GEOL 311*

Structure and behavior of clay minerals, humic substances and biochar in soil environments, with emphasis on reactions and environmental implications.

**AGRON 556: Agroecosystem Ecology**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 3 credits in chemistry and 6 credits in biology; Recommended: ENSCI 382, ENSCI 553, or upper-level coursework in nutrient cycles*

Major, biologically important agroecosystem nutrient cycles as linked to energy (carbon) and water. Effects of agricultural production and management on cycling within systems and transfer among system at local, regional and global scales will be emphasized.

**AGRON 559: Environmental Soil and Water Chemistry**

(Dual-listed with AGRON 459). (Cross-listed with ENSCI). (3-3) Cr. 4. F.

*Prereq: 6 credit of CHEM; (AGRON 182 or AGRON 360); MATH 140*

An introduction to the chemical properties of soils, chemical reactions and transformations in soils and surface waters, and their impact on the environment. Topics include solution chemistry in soils and surface waters, solid-phase composition of soils, reactions at the solid-solution interface, and applications to contemporary environmental issues.

AGRON 354; GEOL 100 recommended.

**AGRON 561: Population and Quantitative Genetics for Breeding**

(Cross-listed with AN S). (4-0) Cr. 4. F.

*Prereq: STAT 587*

Population and quantitative genetics for plant and animal genetics. Study of the genetic basis and analysis of variation in quantitative traits in domestic or experimental populations using phenotypic and molecular marker data, including estimation of heritability and other genetic parameters, linkage analysis and mapping of quantitative trait loci, and the impact of inbreeding, heterosis, and genotype-by-environment interaction.

**AGRON 563: Soil Formation and Landscape Relationships**

(Dual-listed with AGRON 463). (Cross-listed with ENSCI). (3-0) Cr. 3. F. Relationships between soil formation, geomorphology, and environment. Soil description, classification, geography, mapping, and interpretation for land use. Two weekend field trips. AGRON 182 or ENSCI 250 recommended. Credit for one of AGRON 463 or AGRON 463I may be applied for graduation.

**AGRON 570: Risk Assessment for Food, Agriculture and Veterinary Medicine**

(Cross-listed with TOX, VDPAM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Statistics 300-level or higher.*

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

**AGRON 575: Soil Formation and Transformation**

(Cross-listed with ENSCI). (1-0) Cr. 1. F.

*Prereq: AGRON 463 or equivalent*

A one-week intensive field class examining the pedology of Iowa under natural and transformed con.

**AGRON 577: Soil Physics**

(Dual-listed with AGRON 477). (Cross-listed with ENSCI). (3-0) Cr. 3. S.

The physical soil system: the soil components and their physical interactions; transport processes involving water, air, and heat. AGRON 182 recommended.

**AGRON 578: Laboratory Methods in Soil Physics**

(Cross-listed with ENSCI). (0-3) Cr. 1. S.

*Prereq: concurrent enrollment in AGRON 477 or AGRON 577*

Methods of measuring soil physical properties such as texture, density, and water content, and transport of heat, water, and gases.

**AGRON 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with ENT, HORT, PL P). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**AGRON 584: Organic Agricultural Theory and Practice**

(Dual-listed with AGRON 484). (Cross-listed with HORT, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in biological or physical sciences*

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

**AGRON 585: Soil and Environmental Microbiology**

(Dual-listed with AGRON 485). (Cross-listed with ENSCI, MICRO). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**AGRON 588: Raster GIS for Geoscientists**

(Dual-listed with AGRON 488). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**AGRON 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: 15 credits in agronomy*

Literature reviews and conferences on selected topics in crops, soils, or agricultural meteorology according to needs and interest of student.

**AGRON 591: Agronomic Systems Analysis**

(3-0) Cr. 3. S.

*Prereq: AGRON 511, AGRON 513, AGRON 531, AGRON 532, AGRON 533*

Analysis of cropping systems from a problem-solving perspective. Case studies will be used to develop the students' ability to solve agronomic problems.

**AGRON 592: Current Issues in Agronomy**

(3-0) Cr. 3. F.S.

*Prereq: AGRON 501, AGRON 503, AGRON 511, AGRON 512, AGRON 513, AGRON 514*

Critical analysis and discussion of agricultural practices, programs, and policies of current interest to the field of agronomy. Leadership skill development through consideration of technical, social, and ethical components underlying controversial topics. Enhancement of communication proficiency through debate and writing in order to define problems, articulate possible solutions, and propose appropriate courses of action. Required course for the Master of Science in agronomy degree program.

**AGRON 593: Workshop in Agronomy**

Cr. arr. Repeatable.

*Prereq: Graduate classification*

**AGRON 594: Agronomy MS Practicum**

(1-0) Cr. 1. SS.

*Prereq: AGRON 501, AGRON 502, AGRON 503, AGRON 514 or current enrollment. Recommended: AGRON 511, AGRON 512, AGRON 513*

Practical field and laboratory experiences integrating coursework in climatology, crops, and soils. Includes lectures, labs and field tours.

**AGRON 595: Seed Quality, Production, and Research Management**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Advanced survey of the organization, staff capabilities and management characteristics typical in seed production and crop improvement in seed enterprises. Analysis of the use of quality information in the management of seed operations and sales. Process management applications for seed. Production planning for existing capacity. Analysis of the manager's tasks in the annual cycle and how the tasks of these managers relate to the general categories of business management roles. Difference in management strategies used with different situations and groups of employees.

**AGRON 599: Creative Component**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599A: Agricultural Meteorology**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599B: Crop Production and Physiology**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599C: Plant Breeding**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599D: Soil Chemistry**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599E: Soil Fertility**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599F: Soil Management**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599G: Soil Microbiology and Biochemistry**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599H: Soil Morphology and Genesis**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599I: Soil Physics**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599K: Seed Science**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599L: Weed Science**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AGRON 599M: Agronomy**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**Courses for graduate students:****AGRON 600: Seminar**

(1-0) Cr. 1. Repeatable, maximum of 6 times. F.S.

Reports and discussion of recent literature and research.

**AGRON 600A: Seminar: Plant Breeding**

(1-0) Cr. 1. Repeatable, maximum of 6 times. S.

Instruction and practice in giving scientific presentations related to the fields of plant breeding, genetics, or genomics, with an emphasis on effective communication and presentation techniques.

**AGRON 600B: Seminar: Soils**

(1-0) Cr. 1. Repeatable, maximum of 6 times. S.

Reports and discussion of recent literature and research.

**AGRON 600C: Seminar: Crop Production and Physiology**

(1-0) Cr. 1. Repeatable, maximum of 6 times. F.S.

Reports and discussion of recent literature and research.

**AGRON 601: Agronomic Science Presentations**

(3-0) Cr. 2. S.

*Prereq: graduate status in agronomic science, permission of instructor.*

Experience in critical communications in exchange of ideas through oral and poster presentations and scientific questioning/evaluation.

**AGRON 605: Boundary-Layer Meteorology**

(Cross-listed with MTEOR). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MTEOR 443 or equivalent-level course in engineering fluids*

Atmospheric boundary-layer structure and dynamics. Diurnal and seasonal variations, turbulent fluxes and turbulence kinetic energy. Measurements and empirical relations for wind and temperature near the ground. Numerical simulation and applications to wind energy.

**AGRON 610: Foundations of Sustainable Agriculture**

(Cross-listed with A B E, ANTHR, SOC, SUSAG). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**AGRON 621: Advanced Plant Breeding**

(3-0) Cr. 3. S.

*Prereq: AGRON 521, AGRON 526, AGRON 561, GEN 410*

Genetics of breeding populations, means of genotypes and breeding populations, mapping quantitative trait loci, variation in breeding populations, genetic design, genotype by environment interaction, selection in breeding populations, recurrent selection, marker-assisted selection, best linear unbiased prediction, genome-wide association studies, genomic selection, heterosis and hybrid prediction, and multiple traits.

**AGRON 625: Genetic Strategies in Plant Breeding**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AGRON 521 and GDCB 510*

Evaluation of genetic, molecular, and cellular approaches to crop improvement; gene transfer methods. Application and role of basic plant biology in breeding programs and processes; genome structure and function, gene isolation, expression, regulation, and modification. Integration of molecular and cellular methods in breeding strategies; analysis of alternative breeding methods, regulatory and ethical issues.



**AGRON 677: Advanced Soil Physics**

(2-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AGRON 577 and MATH 266; COM S 207 recommended*

The flow and distribution of water, chemicals, and heat in soils. Physical principles and applications.

**AGRON 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with BCB, E E, ENGR, GENET, M E). (3-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq: Graduate student status and completion of at least one semester of graduate coursework.*

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**AGRON 696: Research Seminar**

(Cross-listed with BBMB, FOR, GDCB, HORT, PLBIO). Cr. 1. Repeatable.

Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**AGRON 698: Agronomy Teaching Practicum**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Graduate classification in agronomy and permission of instructor*  
Graduate student experience in the agronomy teaching program. Offered on a satisfactory-fail basis only.

**AGRON 699: Research**

Cr. arr. Repeatable.

**AGRON 699A: Agricultural Meteorology**

Cr. arr. Repeatable.

**AGRON 699B: Crop Production and Physiology**

Cr. arr. Repeatable.

**AGRON 699C: Plant Breeding**

Cr. arr. Repeatable.

**AGRON 699D: Soil Chemistry**

Cr. arr. Repeatable.

**AGRON 699E: Soil Fertility**

Cr. arr. Repeatable.

**AGRON 699F: Soil Management**

Cr. arr. Repeatable.

**AGRON 699G: Soil Microbiology and Biochemistry**

Cr. arr. Repeatable.

**AGRON 699H: Soil Morphology and Genesis**

Cr. arr. Repeatable.

**AGRON 699I: Soil Physics**

Cr. arr. Repeatable.

**AGRON 699J: Plant Physiology**

Cr. arr. Repeatable.

**AGRON 699K: Seed Science**

Cr. arr. Repeatable.

**AGRON 699L: Weed Science**

Cr. arr. Repeatable.

## Air Force Aerospace Studies (AFAS)

*Any experimental courses offered by AFAS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**AFAS 103: Introductory Leadership Laboratory with Physical Training**

(0-4) Cr. 2. Repeatable, maximum of 4 credits. F.S.

Instruction for new cadets on Air Force customs and courtesies; drill and ceremonies, issuing military commands, studying the environment of an Air Force officer and learning about areas of opportunity available to commissioned officers while also using basic military training skills and instruction to develop confidence, leadership, and communication skills through physical fitness. Full participation in all events will be determined based on student's physical and medical eligibility. Membership as a cadet in AFROTC recommended. Offered on a satisfactory-fail basis only.

**AFAS 141: Foundations of the United States Air Force**

(1-0) Cr. 1. F.

No-commitment exploratory course introducing the United States Air Force and the Air Force Reserve Officer Training Corps program. Topics include Air Force heritage and culture, professional military officership values and expectations, and future career opportunities with an emphasis on cultivating leadership and communication skills.

**AFAS 142: Foundations of the United States Air Force**

(1-0) Cr. 1. S.

A continuation of 141. Topics expand Air Force history and heritage by examining the various functions of airpower and the organizational/command structures used to employ them. Introduces leading theories of warfare and conflict, basic principles and tenets of Air Force doctrine to guide future war planners. The course places emphasis on leadership and team building, further study of interpersonal communication, and above all, ethical decision making in the context of a military environment.



**AFAS 203: Basic Leadership Laboratory with Physical Training**

(0-4) Cr. 2. Repeatable, maximum of 4 credits. F.S.

Instruction and critique of cadets on Air Force customs and courtesies, drill and ceremonies, and issuing military commands in preparation for AFROTC summer Field Training while also using basic military training skills and instruction to develop confidence, leadership, and communication skills through physical fitness. Full participation in all events will be determined based on student's physical and medical eligibility. Membership as a cadet in AFROTC recommended. Offered on a satisfactory-fail basis only.

**AFAS 251: Team and Leadership Fundamentals**

Cr. 1. F.

Measuring character through self-assessment and its importance for leadership and team building. The importance of listening and communication for mission accomplishment. Leadership, team building, and problem solving skills in the context of Air Force core values.

**AFAS 252: Team and Leadership Fundamentals II**

Cr. 1. S.

Defining leadership through the lens of human relations, conflict and stress management, and ethical decision making. The importance of leveraging diversity and collaborative relationships with negotiating and resiliency techniques in the context of Air Force core values.

**AFAS 303: Intermediate Leadership Laboratory with Physical Training**

(0-4) Cr. 2. Repeatable, maximum of 4 credits. F.S.

Mid-level management of leadership experience involving planning and controlling of most AFROTC military activities. Students will help senior leadership to prepare and present briefings and other oral and written communications; provide interviews, guidance, and information that will increase the understanding, motivation, and performance of other cadets; and use advanced military training skills and instruction to develop confidence, leadership, and communication skills through physical fitness. Full participation in all events will be determined based on student's physical and medical eligibility. Membership as a cadet in AFROTC recommended. Offered on a satisfactory-fail basis only.

**AFAS 341: Air Force Leadership Studies I**

(3-0) Cr. 3. F.

Presents the complex issues of leadership and management in the U.S. Air Force; a large and diverse organization. The theoretical aspects of leadership, management, communications, motivation and problem-solving are examined and studied against the backdrop of the U.S. Air Force.

**AFAS 342: Air Force Leadership Studies II**

(3-0) Cr. 3. S.

*Prereq: AFAS 341*

A continuation of AFAS 341. Examines the theoretical aspects of leadership, management, communications, and supervisory skills while studying them against the backdrop of the U.S. Air Force.

**AFAS 403: Advanced Leadership Laboratory with Physical Training**

(0-4) Cr. 2. Repeatable, maximum of 6 credits. F.S.

Advanced leadership experience involving the planning and controlling of all upper-level AFROTC military activities. Students will prepare and present briefings and other oral and written communications; provide interviews, guidance, and information that will increase the understanding, motivation, and performance of other cadets; and use advanced military training skills and instruction to develop confidence, leadership, and communication skills through physical fitness. Full participation in all events will be determined based on student's physical and medical eligibility. Membership as a cadet in AFROTC recommended. Offered on a satisfactory-fail basis only.

**AFAS 441: National Security Studies**

(3-0) Cr. 3. F.

Traces constitutional roots of authority and responsibilities to the Air Force officer, to include development of national security and strategy that defines US military policy and priorities. Applies legislation, joint doctrine, and relationships of operational and administrative authority concepts in the US military in the context of regional studies.

**AFAS 442: Preparation for Active Duty**

(3-0) Cr. 3. S.

Explores the range of professional, personal and social support structures available to US Air Force officers on active duty. Examines practical supervision tools to manage expectations, career development, and disciplinary action leading to the oath of office and acceptance of a commission in the US Air Force.

Meets International Perspectives Requirement.

**AFAS 483: Situational Leadership Laboratory with Physical Training**

Cr. 2. Repeatable, maximum of 4 times. F.S.

*Prereq: AFAS 403*

Situational leadership laboratory is for extended cadets that have completed the AFROTC curriculum but have not finished their degree. This provides an opportunity to continue growing as a leader in supervisory and mentorship positions while assisting the cadre with planning and controlling of all upper-level AFROTC military activities. Extended cadets will have the opportunity to work directly with cadre on special projects and duties that further prepare them for life as an active duty officer. Full participation in all events will be determined based on student's physical and medical eligibility. Membership as a cadet in AFROTC recommended. Offered on a satisfactory-fail basis only.

# American Indian Studies (AM IN)

**Any experimental courses offered by AM IN can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## **AM IN 201: Native People in American Culture**

(3-0) Cr. 3. F.S.SS.

Perceptions and realities of Native people living in and responding to American society and culture. Topics include representations, contemporary Native identity, literature, the arts, history, film, and issues of diversity.

## **AM IN 205: American Indians in the Movies**

(3-0) Cr. 3. Alt. SS., offered irregularly.

Examines the role of American Indians in the movie industry. Explores the development of American Indian characters and filmmaking, and the relevance for Native communities, through feature films and academic analysis. One focus is a comparison of non-Native and Native films in form, content, and message, and the changing character of Native representation in both.

## **AM IN 210: Introduction to American Indian Studies**

(3-0) Cr. 3. F.S.SS.

Introduction to the multidisciplinary aspects of American Indian Studies. Topics include the relevant events and ideas defining the contemporary American Indian experience, on and off reservation, in the United States. Sovereignty, identity, jurisdiction, taxes, economic development, education, and other issues are addressed.

Meets U.S. Diversity Requirement

## **AM IN 225: American Indians of Iowa**

(Cross-listed with ANTHR). Cr. 3. F.

Cultures and histories of Native people who have called the present state of Iowa home; primary focus on the period between 1700 CE and the present; Native interactions with Spanish, French, British, and American people.

## **AM IN 240: Introduction to American Indian Literature**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Survey of American Indian Literature of varying genres, including fiction, non-fiction, poetry, film, drama, and media. Focuses on interdisciplinary approaches to American Indian cultural, social, and environmental issues.

## **AM IN 310: Contemporary Topics in American Indian Studies**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

Examines contemporary issues and important topics affecting Native communities overall. AM IN 210 recommended.

## **AM IN 311: Federal Indian Law and Policy**

(3-0) Cr. 3.

Examines the impact of federal American Indian policies on Native communities, especially contemporary Indian Country and communities. Topics include sovereignty, recognition, the role of the Supreme Court, specific policies like allotment, and other relevant issues. AM IN 210 recommended.

## **AM IN 312: American Indian Education**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

Examines current and historical issues in American Indian education. Topics include traditional education, changes to formal education, tribal colleges and universities, current school systems, and other relevant topics. AM IN 210 recommended.

## **AM IN 313: Native Land, Water, and Resources**

(Cross-listed with NREM). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Examines Native land rights, water rights, and natural resources. Topics may include Native relations to landscapes, cultural resources and infrastructure projects, land rights, water usage agreements, and resource policies as they apply to on- and off-reservation Native communities. AM IN 210 recommended.

## **AM IN 315: Archaeology of North America**

(Cross-listed with ANTHR). (3-0) Cr. 3. S.

*Prereq: ANTHR 202*

Prehistory and early history of North America as reconstructed from archaeological evidence; peopling of the New World; culture- historical sequences of major culture areas; linkages of archaeological traditions with selected ethnohistorically known Native American groups.

## **AM IN 320: Great Plains Archaeology**

(Cross-listed with ANTHR). (3-0) Cr. 3. F.

*Prereq: ANTHR 202*

Prehistoric societies of the Great Plains region of North America, from initial occupation to European contact; emphasis on sociocultural changes, continuities, and adaptations to changing environments using archaeological, ecological, ethnographic information.

## **AM IN 322: Peoples and Cultures of Native North America**

(Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: AM IN 210 or ANTHR 201*

Origin, distribution, and pre-contact life of the indigenous peoples of North America. Survey of culture areas; language families, social and political systems, ecological and economic adaptations, religion and spirituality; impact of European contact; cultural resilience and revitalization in contemporary American Indian life.

**AM IN 324: Health and Native American Communities**

(Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ENGL 250*

Overview of historic and contemporary health and health care in Native Communities. Indian Health Service and specific regulations. Consideration of both cultural and scientific approaches to medicine. Specific health issues (e.g., diabetes, alcoholism, depression, etc.) in American Indian communities.

**AM IN 332: Current Issues in Native North America**

(Dual-listed with AM IN 532). (Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**AM IN 332A: Current Issues in Native North America: Gender and Family**

(Dual-listed with AM IN 532A). (Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**AM IN 332B: Current Issues in Native North America: Indigenous Ecologies and Geographies**

(Dual-listed with AM IN 532B). (Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**AM IN 332C: Current Issues in Native North America: Cultural and Political Movements**

(Dual-listed with AM IN 532C). (Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**AM IN 332D: Current Issues in Native North America: Regional Focus**

(Dual-listed with AM IN 532D). (Cross-listed with ANTHR). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**AM IN 346: American Indian Literature**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of American Indian literature of varying genres, including fiction, non-fiction, poetry, film, drama, and media. Examines interdisciplinary approaches to American Indian cultural, social, and environmental issues.

**AM IN 426: Topics in Native American Architecture**

(Cross-listed with ARCH). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

History, theory, and principles of Native American/American Indian architecture, landscape architecture and planning considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment History, Theory, Culture. A maximum of 6 credits of ARCH 426 may be applied to degree program.

**AM IN 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in AM IN; Permission of Instructor; Permission of Program Director*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 6 credits in AM IN 490 may be counted toward graduation. If more than 3 credits in AM IN 490 are taken, they must be from different instructors.

## American Sign Language (ASL)

***Any experimental courses offered by ASL can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**ASL 101: American Sign Language I**

(4-0) Cr. 4. F.S.

Introduction to American Sign Language (ASL). Development of expressive and receptive skills including vocabulary, grammar, usage, and cultural information. Note: Distinct from "Signed English". ASL is a natural language with its own rules of grammar and usage.

**ASL 102: American Sign Language II**

(4-0) Cr. 4. S.

*Prereq: ASL 101*

Introduction to American Sign Language (ASL) II continues development of expressive and receptive skills introduced in American Sign Language I, including vocabulary, grammar, usage, and cultural information. Distinct from "Signed English". ASL is a natural language with its own rules of grammar and usage.

**ASL 107: Introduction to the Deaf-World**

(1-0) Cr. 1.

Nature and significance of the Deaf-World as a cultural and linguistic minority.

**ASL 201: Intermediate American Sign Language I**

(4-0) Cr. 4. F.

*Prereq: ASL 102*

Development of fluency for intermediate conversational skills. Review of grammar and varying grammatical forms for both structured and unstructured social situations such as sharing opinions, discussing weekend activities, and exchanging views on current topics.

**ASL 202: Intermediate American Sign Language II**

(4-0) Cr. 4. S.

*Prereq: ASL 201*

A continuation and further application of language principles learned in ASL 201, to deepen ability to actively engage in dialogue both in structured and unstructured social situations. Further fluency in intermediate conversational skills will be developed, particularly in the areas of semantic equivalence and dialogic/monologic register.

**ASL 275: Topics in Deaf Culture**

(3-0) Cr. 3.

Focus on contemporary topics in Deaf Culture, Communities, and History. Readings and discussion from a wide range of sources. Topics vary according to faculty interest.

**ASL 305: ASL Classifiers and Depiction**

(3-0) Cr. 3.

*Prereq: ASL 201*

Focused analysis, documentation, discussion, and increased development of classifiers and depiction in ASL. Investigation in how these grammatical features are deliberately incorporated into conversational, presentational, scientific, and artistic language production.

**ASL 325: Deaf Peoples: Pre-World War II**

(3-0) Cr. 3. F.

*Prereq: ASL 202 or Permission of Instructor*

Perspectives on and treatment of deaf people as individuals and groups prior to World War II. Taught in American Sign Language.

**ASL 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits in ASL; Permission of Instructor*

Designed to meet the needs of students in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 6 credits of ASL 490 may be counted towards graduation.

## Animal Ecology (A ECL)

***Any experimental courses offered by A ECL can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****A ECL 231: Principles of Wildlife & Fisheries Conservation**

Cr. 3. S.

*Prereq: BIOL 211; BIOL 212; NREM 120*

Introduction to the principles of wildlife and fisheries management. Case studies will be explored along with assessment methods used to understand management including conservation of populations, species and communities, as well as habitat preservation and restoration.

**A ECL 312: Ecology**

(Cross-listed with BIOL, ENSCI). (3-3) Cr. 4. F.SS.

*Prereq: BIOL 211; (BIOL 212 or BIOL 251)*

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats.

**A ECL 321: Fish Biology**

(2-3) Cr. 3. S.

*Prereq: A ECL 365*

Biology, ecology, and evolution of fishes. Emphasis on structure, physiology, and behavior, including a focus on the conservation and management of fishes and their habitats. Laboratory focus on fish morphology, survey methods, identification, distribution, habits, and habitats of fishes.

**A ECL 333: Fisheries Techniques**

(Cross-listed with NREM). (1-3) Cr. 2. F.

*Prereq: BIOL 212*

Introduction to techniques used in the collection and interpretation of fish population data in the field and in the lab. Course objectives include an understanding of population survey methodology and improving student critical thinking and teamwork skills. Laboratory focuses on field trips and hands-on sampling experience.

**A ECL 365: Vertebrate Biology**

(Cross-listed with BIOL). (3-2) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L*

Evolution, biology, and classification of fish, amphibians, reptiles, birds, and mammals. Emphasis on a comparative analysis of the structure and function of organ systems. Laboratory exercises concentrate on morphology and identification of orders of vertebrates.

**A ECL 366: Natural History of Iowa Vertebrates**

(2-3) Cr. 3. S.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Vertebrate fauna of Iowa, including fishes, amphibians, reptiles, birds, and mammals. Species identification, habitat requirements, community structure and assessment, conservation issues that include historical population changes and value of wild animals to the region's ecological and economic health.

**A ECL 371: Ecological Methods**

(Cross-listed with BIOL). (2-3) Cr. 3. F.

*Prereq: A ECL 312; (STAT 101 or STAT 104)*

Quantitative techniques used in management of natural resources with emphasis on inventory and manipulation of habitat and animal populations.

**A ECL 372: Wildlife Population Methods**

(1-8) Cr. 4. SS.

*Prereq: BIOL 312 or NREM 311*

Field-intensive study of population ecology. Emphasis on hands-on learning of study design and techniques to assess population trends in plants, invertebrates, and vertebrates inhabiting terrestrial and aquatic ecosystems.

**A ECL 375: Marine Ecology and Ecosystems Dynamics**

(Cross-listed with BIOL, ENSCI). (3-0) Cr. 3. S.

*Prereq: BIOL 211*

Overview of the ecological processes, ecosystems, and biodiversity in marine environments. Ever-changing dynamics caused by environmental disturbances, internal forces, or by human impacts on species and ecosystems.

**A ECL 401: Intro to Aquatic Animal Medicine**

(Cross-listed with B M S). (1-2) Cr. 1. S.

8-week course. Introductory course with focus on fin fish production, health and medicine. Course content will help define future roles for veterinarians, producers, and service providers. Emphasis will be placed on water-evaluation, anatomy, pathology, infectious diseases, nutrition, regulatory constraints in production, food safety, biosecurity and current research. Field trip to aquaculture facility.

**A ECL 406: Wildlife Camp**

Cr. 3. F.

*Prereq: BIOL 211; Animal Ecology major; Permission of Instructor*

Introduction to methods and career options in wildlife research and management through field work. Two-week field work experience followed by on-campus reflection, analysis and presentation of field data.

**A ECL 415: Ecology of Freshwater Invertebrates, Plants, and Algae**

(Dual-listed with A ECL 515). (2-3) Cr. 3. F.

*Prereq: A ECL 312*

Identification, biology, and ecological requirements of freshwater invertebrates, plants and algae. Additional emphases on community sampling methods and analysis, and use of organisms as tools for aquatic ecosystem health assessment.

**A ECL 418: Stream Ecology**

(Dual-listed with A ECL 518). (Cross-listed with ENSCI). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A ECL 486*

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**A ECL 425: Aquatic Insects**

(Dual-listed with A ECL 525). (Cross-listed with ENT). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**A ECL 435: Entomology Field Trip**

(Cross-listed with ENT). Cr. 2. Repeatable, maximum of 2 times. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: BIO 312; Permission of Instructor*

Field trip to study insects of major terrestrial and aquatic ecosystems. Location and duration vary. ENT 370 or ENT 425 recommended.

**A ECL 440: Fishery Management**

(Dual-listed with A ECL 540). (2-3) Cr. 3. F.

*Prereq: A ECL 312; A ECL 321; A ECL 333; (STAT 101 or STAT 104); credit or concurrent enrollment in A ECL 486*

Biological basis of fishery management, fishery problems, and management practices for freshwater, anadromous, and marine fisheries.

**A ECL 442: Aquaculture**

(Dual-listed with A ECL 542). (3-0) Cr. 3. S.

*Prereq: BIOL 211; BIOL 212*

Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetics, diseases, and marketing.

**A ECL 451: Wildlife Ecology and Management**

(2-3) Cr. 3. S.

*Prereq: A ECL 371*

Ecological theory and practice of wildlife management, including, population ecology, habitat management, and current issues in the field. Course involves a series of case studies addressing actual wildlife issues using field and quantitative methods.

**A ECL 454: Principles of Wildlife Disease**

(Dual-listed with A ECL 554). (3-0) Cr. 3. S.

*Prereq: Junior classification; 10 credits in BIOL at the 300+ level*

Ecological and epidemiological aspects of diseases as they relate to wildlife populations. Topics to be covered include: major classes of disease; detection, description, monitoring, and management of disease; characteristics and interactions between disease agents and wildlife hosts; relationships among wildlife, domestic animal, and human health.

**A ECL 455: International Wildlife Issues**

(3-0) Cr. 3. F.

*Prereq: A ECL 365; (A ECL 312 or Graduate standing); NREM 120*

Biological, political, social, and economic factors affecting the management of international wildlife resources.

Meets International Perspectives Requirement.

**A ECL 457: Herpetology**

(Cross-listed with BIOL). (2-0) Cr. 2. F.

*Prereq: BIOL 351 or BIOL 365*

Biology, ecology, and evolution of amphibians (salamanders, frogs, caecilians) and reptiles (lizards, snakes, tuatara, turtles, crocodilians). Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of amphibians and reptiles in ecosystems, and conservation. Laboratory focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**A ECL 457L: Herpetology Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. F.

*Prereq: BIOL 351 or BIOL 365 or A ECL 365; Concurrent enrollment in BIOL 457 or A ECL 457*

Laboratory to accompany Biology/Animal Ecology 457. Focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**A ECL 458: Ornithology**

(Cross-listed with BIOL). (2-0) Cr. 2. S.

*Prereq: A ECL 365 or BIOL 351*

Biology, evolution, ecology and taxonomy of birds. Emphasis on structure, physiology, behavior, communication, navigation, reproduction, and conservation.

**A ECL 458L: Ornithology Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. S.

*Prereq: (A ECL 365 or BIOL 351); concurrent enrollment in A ECL 458 or BIOL 458*

Laboratory complements lecture topics with emphasis on external anatomy, identification and distribution of Midwest birds, and field trips.

**A ECL 459: Mammalogy**

(Cross-listed with BIOL). (2-0) Cr. 2. S.

*Prereq: A ECL 365 or BIOL 351*

Biology, ecology, and evolution of mammals. Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of mammals in ecosystems, and conservation.

**A ECL 459L: Mammalogy Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. S.

*Prereq: (A ECL 365 or BIOL 351); concurrent enrollment in (A ECL 459 or BIOL 459)*

Laboratory focus on identification, survey methods, distribution, habits, and habitats of mammals. Several field trips.

**A ECL 471: Introductory Conservation Biology**

(Cross-listed with BIOL). Cr. 3. S.

*Prereq: BIOL 312*

Examination of conservation issues from a population and community perspective. The role of genetics, demography, and environment in determining population viability, habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**A ECL 480: Studies in Marine Biology**

Cr. 1-8. Repeatable. SS.

Courses taken at Gulf Coast Research Laboratory and other marine biological stations are transferred to Iowa State University under this number.



**A ECL 486: Aquatic Ecology**

(Dual-listed with A ECL 586). (Cross-listed with BIOL, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**A ECL 486L: Aquatic Ecology Laboratory**

(Dual-listed with A ECL 586L). (Cross-listed with BIOL, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**A ECL 489: Population Ecology**

(Dual-listed with A ECL 589). (Cross-listed with BIOL). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**A ECL 515: Ecology of Freshwater Invertebrates, Plants, and Algae**

(Dual-listed with A ECL 415). (2-3) Cr. 3. F.

*Prereq: A ECL 312*

Identification, biology, and ecological requirements of freshwater invertebrates, plants and algae. Additional emphases on community sampling methods and analysis, and use of organisms as tools for aquatic ecosystem health assessment.

**A ECL 516: Avian Ecology**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A ECL 365, A ECL 312, or graduate standing*

Current topics and theories including avian breeding and foraging ecology, population biology, community structure, habitat selection, field methodologies, and data interpretation.

**A ECL 518: Stream Ecology**

(Dual-listed with A ECL 418). (Cross-listed with ENSCI). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A ECL 486*

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**A ECL 520: Fisheries Science**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A ECL 312, A ECL 321*

Concepts, approaches, and techniques for assessment of recreational and commercial fisheries. Scope will range from individual fish to entire ecosystems, both freshwater and marine.

**A ECL 525: Aquatic Insects**

(Dual-listed with A ECL 425). (Cross-listed with ENT). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**A ECL 531: Conservation Biology**

(Cross-listed with EE0B). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 312; BIOL 313 or graduate standing*

Examination of conservation issues from a population and a community perspective. Population-level analysis will focus on the role of genetics, demography, and environment in determining population viability. Community perspectives will focus on topics such as habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**A ECL 540: Fishery Management**

(Dual-listed with A ECL 440). (2-3) Cr. 3. F.

*Prereq: A ECL 312; A ECL 321; A ECL 333; (STAT 101 or STAT 104); credit or concurrent enrollment in A ECL 486*

Biological basis of fishery management, fishery problems, and management practices for freshwater, anadromous, and marine fisheries.

**A ECL 542: Aquaculture**

(Dual-listed with A ECL 442). (3-0) Cr. 3. S.

*Prereq: BIOL 211; BIOL 212*

Concepts related to the culture of aquatic organisms including culture systems, water quality, nutrition, genetics, diseases, and marketing.

**A ECL 551: Behavioral Ecology**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: a course in ecology or animal behavior*

The study of how an animal's behavior affects its ability to survive and reproduce in its environment. Course topics, such as foraging behavior, sexual selection, parental care, etc., represent the interface of ecology, evolution, and behavior.

**A ECL 554: Principles of Wildlife Disease**

(Dual-listed with A ECL 454). (3-0) Cr. 3. S.

*Prereq: Junior classification; 10 credits in BIOL at the 300+ level*

Ecological and epidemiological aspects of diseases as they relate to wildlife populations. Topics to be covered include: major classes of disease; detection, description, monitoring, and management of disease; characteristics and interactions between disease agents and wildlife hosts; relationships among wildlife, domestic animal, and human health.

**A ECL 586: Aquatic Ecology**

(Dual-listed with A ECL 486). (Cross-listed with EEOB, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**A ECL 586L: Aquatic Ecology Laboratory**

(Dual-listed with A ECL 486L). (Cross-listed with EEOB, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**A ECL 589: Population Ecology**

(Dual-listed with A ECL 489). (Cross-listed with EEOB). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**A ECL 599: Creative Component**

Cr. arr.

*Prereq: Nonthesis M.S. option only*

**Courses for graduate students:****A ECL 611: Analysis of Populations**

(2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312; STAT 401; a course in calculus*

Quantitative techniques for analyzing vertebrate population data to estimate parameters such as density and survival. Emphasis on statistical inference and computing.

**A ECL 698: Animal Ecology Teaching Practicum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification in animal ecology and permission of instructor*  
Graduate student experience in the animal ecology teaching program.  
Offered on a satisfactory-fail basis only.

**A ECL 699: Research**

Cr. arr. Repeatable.

## Animal Science (AN S)

***Any experimental courses offered by AN S can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****AN S 101: Working with Animals**

(1-2) Cr. 2. F.S.SS.

An introductory course in skills for proper care, handling, and management of domestic animals. Terminology and skills in working with animals, identification, life-cycle management practices, and animal health management are introduced and examined.

**AN S 110: Orientation in Animal Science and ISU**

(2-0) Cr. 1. F.S.

Orientation to the university and Department of Animal Science. Challenges and opportunities available to the professional animal agriculturalist. Professional goal setting, portfolio development, and development of interpersonal skills in the context of pursuing a career in animal science.

**AN S 114: Survey of the Animal Industry**

(2-0) Cr. 2. F.S.

Principles of management and care of domestic animals, including genetics, nutrition, and reproduction. Service of domestic animals to society in terms of food, shelter, protection, fuel and emotional well-being. Basic biology, industry structure, management practices and production systems.

**AN S 116: Practicum in Safe Equine Handling and Welfare**

(0-3) Cr. 1. F.

Development of best practices for safe horse handling and practical equine health care tasks. Course will focus on equine welfare and human safety as well as provide training in necessary every day skills needed to own a horse or to work at a horse farm. Certificate of Safe Equine Handling and Welfare available upon course completion.

**AN S 190: Livestock Handling, Safety and Welfare**

(Cr. 2. F.S.)

*Prereq: AN S 101*

Understanding of animal perception to develop best care practices involved in handling of livestock species (beef, sheep, swine, dairy, equine, poultry). Intensive development of skills associated with handling and moving healthy and compromised livestock in respect to human and animal welfare. Integration of scientific and theoretical knowledge of biosecurity and animal-human interactions as it related to livestock handling and movement.

**AN S 199: Marketing and Management of Livestock Events**

(0-2) Cr. 1. Repeatable. F.S.

*Prereq: Credit or concurrent enrollment in AN S 101 or AN S 114*

Management and coordination of livestock shows, sales and events, including program planning, staff and volunteer management, time management, publicity and promotion for fairs, shows, clinics, expos, and other events. Offered on a satisfactory-fail basis only. A maximum of two credits of AnS 199 may be applied toward the total credits required for graduation.

**AN S 199A: Marketing and Management of Livestock Events: Beef**

(0-2) Cr. 1. Repeatable. F.S.

*Prereq: Credit or concurrent enrollment in AN S 101 or AN S 114*

Management and coordination of livestock shows, sales and events, including program planning, staff and volunteer management, time management, publicity and promotion for fairs, shows, clinics, expos, and other events. Offered on a satisfactory-fail basis only. A maximum of two credits of AnS 199 may be applied toward the total credits required for graduation.

**AN S 199E: Marketing and Management of Livestock Events: Horses**

(0-2) Cr. 1. Repeatable. F.S.

*Prereq: Credit or concurrent enrollment in AN S 101 or AN S 114*

Management and coordination of livestock shows, sales and events, including program planning, staff and volunteer management, time management, publicity and promotion for fairs, shows, clinics, expos, and other events. Offered on a satisfactory-fail basis only. A maximum of two credits of AnS 199 may be applied toward the total credits required for graduation.

**AN S 207: The Art and Heritage of Livestock**

(3-0) Cr. 3. F.

Using art as a venue to understand the legacy and heritage of livestock production and livestock's contribution to civilization and society; livestock's contributions to warfare, social class, industry, economies, etc.; history of the impact of livestock on painting, poetry, music, sculpture, advertising, pop culture, movies, religion and sports in society.

**AN S 210: Career Preparation in Animal Science**

(0-2) Cr. 1. F.S.

*Prereq: Sophomore classification; AN S major*

Life skill development emphasized in the context of career preparation. Assist students with career goal clarification, interview skills, resume and cover letter preparation. Internship development, job shadowing, and exploration of career option.

**AN S 211: Issues Facing Animal Science**

(0-2) Cr. 1. F.S.

*Prereq: AN S 114; Sophomore classification*

Overview of the factors that define contemporary ethical and scientifically based issues facing animal agriculture. Life skill development (including interactive skills, communication ability, organization, information gathering, and leadership skills) emphasized in the context of issues study. Offered on a satisfactory-fail basis only.

**AN S 214: Domestic Animal Physiology**

(3-0) Cr. 3. F.S.

*Prereq: BIOL 212; (CHEM 163 or CHEM 167 or CHEM 177)*

Introduction to anatomy and physiology of the muscular, renal, skeletal, neural, mammary, cardiovascular, respiratory, immune, endocrine, reproductive, and digestive systems of domestic animals.

**AN S 214L: Domestic Animal Anatomy and Physiology Lab**

(0-2) Cr. 1. F.S.

Basic anatomy of domestic animals.

**AN S 216: Equine Science**

(2-2) Cr. 3. F.S.

*Prereq: (AN S 101 or AN S 114); (BIOL 101 or BIOL 211 or BIOL 212)*

Introduction to contemporary concepts, and basic practices and decisions necessary when managing horses through stages of their lives.

**AN S 217: Equine Farm Practicum**

(1-2) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in AN S 216 or Permission of Instructor*

Intensified management of the equine farm. Provide students with experiential learning in all phases of horse production and management. Students assist with general farm management, horse health care, weekly farm management, and related topics.

**AN S 223: Poultry Science**

(2-2) Cr. 3. F.

*Prereq: AN S 101; AN S 114*

Introduction to modern production trends with a focus on broiler, layer, and turkey industries. Topics covered include breeds, handling, management, physiology, nutrition, genetics, health & disease, and products. Weekly labs meet off campus.

**AN S 224: Companion Animal Science**

(2-2) Cr. 3. S.

*Prereq: BIOL 101 or BIOL 211 or BIOL 212*

Introduction to the science of managing companion animals through life stages. Topics covered will include human-animal bond, common and uncommon species kept as pets, breeds, behavior, basic training, nutrition, genetics, and breeding.

**AN S 225: Swine Science**

(2-2) Cr. 3. F.S.

*Prereq: AN S 101; AN S 114*

Introduction to principles, practices and decisions necessary when raising swine through the vertically integrated production cycle. Only AN S 280 and AN S 280L or AN S 225 may count toward graduation.

**AN S 226: Beef Cattle Science**

(2-2) Cr. 3. F.S.

*Prereq: AN S 101; AN S 114*

Introduction to principles, practices and decisions necessary when raising beef cattle through the vertically integrated production cycle.

**AN S 228: Laboratory Animal Science**

Cr. 3. F.

*Prereq: AN S 101; AN S 114*

Introduction to the species, uses, biology, facilities, care, and diseases of animals used in research. AN S 214 recommended.

**AN S 229: Sheep Science**

(2-2) Cr. 3. S.

*Prereq: AN S 101; AN S 114*

Introduction to principles, practices and decisions necessary when raising sheep through their production cycle.

**AN S 235: Dairy Cattle Science**

(2-2) Cr. 3. F.

*Prereq: AN S 101; AN S 114*

Introduction to principles, practices and decisions necessary when raising dairy cattle through the vertically integrated production cycle.

**AN S 270: Foods of Animal Origin**

(2-0) Cr. 2. F.S.SS.

*Prereq: BIOL 212; (CHEM 163 or CHEM 167 or CHEM 177)*

Principles, practices and issues impacting the production, processing and preservation of safe, wholesome, nutritious, and palatable meat, dairy, and egg products. Product evaluation, classification, value, and utilization.

**AN S 270L: Foods of Animal Origin Laboratory**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in AN S 270*

Determination of composition and quality of meat, eggs and milk based on industry and USDA standards. Fundamentals of processing foods of animal origin to add value, maintain quality and ensure safety.

**AN S 280: Basic Swine Science**

(2-0) Cr. 2.

*Prereq: AN S 101; AN S 114*

Basic disciplines and concepts involved in swine production including; industry structure, trends and statistics; production phases and buildings; genetic improvement; reproduction; nutrition; health and biosecurity; nutrient management; marketing and meat quality and career opportunities in the swine industry. Only AN S 280 and AN S 280L or AN S 225 may count toward graduation.

**AN S 305: Livestock Evaluation**

(0-6) Cr. 3. F.

*Prereq: Junior classification*

Fall semester leads to 475A or D. Breeding animal and market animal evaluation of beef, swine and sheep using contemporary techniques and tools. Communication and decision-making skills are practiced in the context of making selection decisions. AN S 270L recommended.

**AN S 306: Equine Evaluation**

(0-6) Cr. 3. S.

*Prereq: Sophomore classification*

Detailed visual evaluation of conformation and performance of the equine athlete. Decision-making skills are practiced in the context of making selection choices. Development of written and oral communication skills as students defend their judgments. Industry trends will be addressed.

**AN S 313: Exercise Physiology of Animals**

(3-0) Cr. 3. F.S.

*Prereq: AN S 214; BIOL 211; (CHEM 163 or CHEM 167 or CHEM 177)*

Physiological adaptations to athletic training in canine and equine athletes. Topics of emphasis include exercise-related adaptations in metabolism, locomotion, the cardiovascular system, musculoskeletal system, and endocrine system. The roles of nutrition and conditioning programs are assessed.

**AN S 316: Equine Reproduction Lab**

Cr. 3. S.

*Prereq: (AN S 116; credit or concurrent enrollment in AN S 331) or Permission of Instructor*

Reproductive anatomy with emphasis on the physiology of normal reproductive function; breeding season management; ways to control and improve reproduction; semen collection, evaluation, and processing; artificial insemination; pregnancy testing; parturition in the mare, foal care. Participation outside of class time is expected.

**AN S 317: Fundamentals of Equine Behavior and Training**

(0-6) Cr. 1-3.

Modifying the behavior of the horse using systematic approaches to horse training emphasizing the psychology of training horses. Equipment and its use and preparation of horses for competition. A maximum of 4 credits of An S 317 may be applied toward graduation.

**AN S 317A: Fundamentals of Equine Behavior and Training: Young Horses at Halter**

(0-6) Cr. 1. F.

Modifying the behavior of the horse using systematic approaches to horse training emphasizing the psychology of training horses. Equipment and its use and preparation of horses for competition. A maximum of 4 credits of An S 317 may be applied toward graduation.

**AN S 317B: Fundamentals of Equine Behavior and Training: Yearlings**

(0-6) Cr. 3.

*Prereq: Permission of Instructor*

Modifying the behavior of the horse using systematic approaches to horse training emphasizing the psychology of training horses. Equipment and its use and preparation of horses for competition. A maximum of 4 credits of An S 317 may be applied toward graduation.

**AN S 317C: Fundamentals of Equine Behavior and Training: Two-year olds and older**

(0-6) Cr. 3.

Modifying the behavior of the horse using systematic approaches to horse training emphasizing the psychology of training horses. Equipment and its use and preparation of horses for competition. A maximum of 4 credits of An S 317 may be applied toward graduation.

**AN S 319: Animal Nutrition**

(3-0) Cr. 3. F.S.

*Prereq: AN S 214; (BBMB 221 or CHEM 331)*

Structure and function of organic and inorganic nutrients. Digestion, absorption, metabolism and utilization of nutrients for maintenance and productive functions. Essential nutritive requirements of domestic livestock, poultry, and companion animals. Sources of nutrients, application of energy systems and concepts, and regulation of feed intake in animals. Students may not receive graduation credit for both AN S 219 and AN S 319.

**AN S 320: Animal Feeds and Feeding**

(2-2) Cr. 3. F.S.

*Prereq: AN S 319*

Principles and practices of animal feed evaluation including nutrient composition and physical properties of common feedstuffs. Utilization of nutrient requirements at various physiological stages to formulate diets using manual and software-based computer methodologies. Students may not receive graduation credit for both AN S 219 and AN S 320.

**AN S 324: Food Processing for Companion Animals**

(3-0) Cr. 3. F.

*Prereq: AN S 319; Junior classification*

Food processing and nutrition for carnivorous companion animals. Topics covered include meat processing and meat preservation for companion animal diets, regulatory standards, cutting edge technologies for processing meat for companion animals, dietary needs of carnivorous companion animals, effect of different processing methods on safety and nutrient bioavailability.

**AN S 331: Domestic Animal Reproduction**

(3-0) Cr. 3. F.S.

*Prereq: AN S 214 or (BIOL 255; BIOL 256) or BIOL 335 or B M S 329*

Comparative anatomy, physiology, and endocrinology of domestic mammalian animal reproduction. Techniques for the control and manipulation of reproductive processes.

**AN S 332: Laboratory Methods in Animal Reproduction**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in AN S 331*

Reproductive anatomy with emphasis on the physiology of normal reproductive function; ways to control and improve reproduction; principles of semen collection and artificial insemination; pregnancy testing.

**AN S 332A: Laboratory Methods in Animal Reproduction: Livestock, Companion, and Laboratory Animals**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in AN S 331*

Comparative reproductive anatomy with emphasis on the physiology of normal reproductive function; ways to control and improve reproduction; principles of semen collection and artificial insemination; pregnancy testing.

**AN S 332E: Laboratory Methods in Animal Reproduction: Equine**

(0-2) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in AN S 331*

Reproductive anatomy with emphasis on the physiology of normal reproductive function; breeding season management; ways to control and improve reproduction; semen collection, evaluation, and processing; artificial insemination; pregnancy testing; parturition in the mare, foal care.

**AN S 333: Embryo Transfer and Related Technologies**

(3-0) Cr. 3. F.

*Prereq: AN S 331 or AN S 332*

Application of embryo transfer and related technologies to genetic improvement of mammalian livestock. Techniques for control of female reproduction, embryo collection and transfer, embryo cryopreservation, and embryo manipulation. Gender selection. Economic and genetic aspects of embryo transfer.

**AN S 334: Embryo Transfer Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in AN S 332 or AN S 333; Permission of Instructor*

Selected laboratory exercises related to embryo transfer such as synchronization of estrus, superovulation, detection of estrus, artificial insemination, embryo collection, embryo evaluation, microscopy, embryo cryopreservation, in vitro fertilization, embryo sexing, rectal palpation, and ultrasonography will be demonstrated and/or performed.

**AN S 335: Dairy Cattle Evaluation**

(0-6) Cr. 3. S.

*Prereq: Sophomore classification*

Evaluation of dairy heifers and lactating dairy cows. Emphasis placed on familiarity with anatomical terms/structures, the use of comparative terminology, decision-making skills, and presentation of oral reasons. (Introduction and skills development course for AN S 475B.).

**AN S 336: Domestic Animal Behavior and Well-Being**

(2-2) Cr. 3. F.

*Prereq: AN S 214*

Understand how managed animals cope and perceive the environment. Principles of behavior and well-being relative to animal care, management and housing. Methods to objectively assess animal well-being. Awareness of animal protection through education/assessments, audits and law.

**AN S 337: Lactation**

(3-0) Cr. 3. S.

*Prereq: AN S 214*

The structure, development and evolution of the mammary gland. Mammary metabolism, milk synthesis; neural and endocrine regulation of mammary function. Immune function and health of the mammary gland. Current events related to lactation.

**AN S 345: Growth and Development of Domestic Animals**

(3-0) Cr. 3. S.

*Prereq: AN S 214*

Basic principles of animal growth and development covered at the tissue, cellular and molecular level. Emphasis placed on skeletal muscle, adipose, bone, and immune system growth and development. The effects of genetics, nutrition, and pharmaceuticals on growth. Course(s) in nutrition, genetics, meat science and/or biochemistry recommended.

**AN S 352: Genetic Improvement of Domestic Animals**

(2-2) Cr. 3. F.S.Alt. SS., offered odd-numbered years.

*Prereq: BIOL 211; (AN S 351X or BIOL 313 or GEN 320); (STAT 101 or STAT 104)*

Principles of qualitative and quantitative genetics applied to improve domestic animal populations. Impact of selection and mating schemes in achieving breeding program goals. Applications and impacts of biotechnological advancements in genetics and genomics.

**AN S 360: Fresh Meat Science and Applied Muscle Biology**

(3-0) Cr. 3. F.

*Prereq: AN S 270; (BBMB 221 or CHEM 331)*

Impact of muscle structure, composition, rigor mortis, inspection, fabrication, handling, packaging and cooking on the palatability, nutritional value, yields, market value, and safety of fresh meat.



### **AN S 373A: Poultry Products Technology**

Cr. 3. SS.

*Prereq: (CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or 212)) or*

*Permission of Instructor*

Basic principles of meat-producing and egg-laying poultry management, meat science, product functionality, egg quality, and food safety, product quality, product functionality, and food safety. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

### **AN S 373B: Applied Avian Physiology**

Cr. 3. SS.

*Prereq: ((CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or 212)) or*

*Permission of Instructor*

Introduction of industry-relevant aspects of avian physiology with emphasis on behavior, neurology, muscle, cardiovascular, immunology, digestive, endocrinology, and reproductive systems for egg and meat producing birds. Focus on avian physiology and relevance to production management and outcomes. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

### **AN S 373C: Avian Health**

Cr. 3. SS.

*Prereq: ((CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or 212)) or*

*Permission of Instructor*

Identification, diagnosis, management, and prevention of diseases in commercial poultry. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

### **AN S 373D: Poultry Nutrition**

Cr. 3. SS.

*Prereq: ((CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or 212)) or*

*Permission of Instructor*

Commercial poultry-specific nutrition with an emphasis on species and age-specific diet formulation, ingredient selection, feed production, and production system. Use of feed additives and production outcomes. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

### **AN S 380A: Swine Breeding and Gestation Management**

Cr. 1. S.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Concepts related to: reproductive physiology and endocrinology of boars and sows; genetic selection programs; development programs for future replacement gilts and boars; semen collection, evaluation, and preparation; detection of estrus and artificial insemination; pregnancy diagnosis; feeding and housing programs for gestating sows; environmental management; records; diseases, and development of quality assurance programs for identifying and solving reproductive problems.

### **AN S 380B: Contemporary Issues in the Swine Industry**

Cr. 1. S.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Evaluation of issues facing today's swine industry including: welfare, nutrient management, and food safety and security. Development of skills needed for effective community relations such as media interviews and message points.

### **AN S 380C: Employee Management for the Swine Industry**

Cr. 1. F.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Effective employee management in swine production units. Principles, policies, and practices related to procurement, development, maintenance, and utilization of employees.

### **AN S 380D: Farrowing Management**

Cr. 1. S.SS.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Advanced integration and application of reproductive management concepts during farrowing and lactation. Identification of production trends; formulation of strategies to improve productivity, and parturition and neonatal management.

### **AN S 380E: Swine Feed Mill Management**

Cr. 1. F.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Principles of feed manufacturing, equipment operation, feed and ingredient quality assurance and regulatory compliance in a modern feed milling operation. Overview of feed mill regulations and safety.

### **AN S 380F: Marketing and Risk Management in the Swine Industry**

Cr. 1. S.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

A comprehensive view of industry structure and trends and marketing options available in the swine industry. Management of risk between markets and/or contracts.

**AN S 380G: Swine Nursery and Finishing Management**

Cr. 1. SS.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Overview of the critical management, housing, and financial considerations relevant to the successful operation of a swine nursery, grow-finish, or wean to finish enterprise, including nutrient requirements; building and facility management; and marketing.

**AN S 380I: Pork Export Markets**

Cr. 1. SS.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Introduction to global markets; cultural preferences and customs associated with the global swine industry. International trade regulations potential impact of foreign animal diseases and bioterrorism affecting the U.S. swine industry.

**AN S 380J: Pork Product Quality and Safety**

Cr. 1. S.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Pre- and post-harvest affecting pork product quality and safety. Overview of pork harvesting process and traits and characteristics of quality pork products.

**AN S 380K: Swine Nutrition**

Cr. 1. F.

*Prereq: AN S 225 or (AN S 280; AN S 280L); AN S 319*

Principles of developing and implementing a swine feeding program. Fundamentals of feeding pigs including nutrients; factors affecting nutrient recommendations; feeding systems and management; feed ingredients, and formulation of swine diets.

**AN S 382: Swine Environment Management**

(1-0) Cr. 1.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Response of swine to thermal environment, ventilation system design and analysis, heating and cooling systems, and examples of various designs for all phases of production. Troubleshooting ventilation systems and energy analysis of production units. TSM 210 Recommended.

**AN S 383: Swine Manure and Nutrient Management**

(1-0) Cr. 1.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Function, application, and advantages and disadvantages of nutrient management systems. Manure production rates, manure handling systems, storage and manure management planning for land application and odor mitigation strategies.

**AN S 384: Swine Health and Biosecurity**

(1-0) Cr. 1.

*Prereq: AN S 225 or (AN S 280; AN S 280L)*

Overview of standard biosecurity protocols and identification of behavior and clinical signs of illness in pigs. Treatment administration and prevention methods. Introduction to immune system function and basic swine disease transmission. Recommended a course in microbiology.

**AN S 399: Animal Science Internship**

Cr. arr. Repeatable. F.S.SS.

**AN S 399A: Animal Science Internship: Graded Internship Experience**

Cr. 2-6. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Learning experience focused on professional development for a career related to animal science. Journal, presentation, and scientific component.

**AN S 399B: Animal Science Internship: Supervised Internship Experience**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Learning experience focused on professional development for a career related to animal science. Journal, presentation, and scientific component. This course is designed for those students who are completing a semester long internship located off campus.

**AN S 411: Addressing Issues in Animal Science**

(0-2) Cr. 1. F.S.

*Prereq: Senior classification; AN S major*

Life skill development emphasized in the context of exploring one's perspective of the most pressing moral and scientific issues facing animal agriculture. Clarification and communication of personal conclusions in small and large group settings expected.

**AN S 415: Equine Systems Management**

(2-2) Cr. 3. F.S.

*Prereq: AN S 216; AN S 319; AN S 320; AN S 331*

Identification and development of financial and production goals in a horse business. Scientific approach to make decisions in management of enterprises in the horse industry.

**AN S 419: Advanced Animal Nutrition**

(2-0) Cr. 2. F.

*Prereq: AN S 319*

Detailed consideration of digestion, metabolism, and assimilation of nutrients. Recent advances and developments in basic nutrition.

**AN S 424: Companion Animal Systems Management**

(2-2) Cr. 3. S.

*Prereq: AN S 224; AN S 319; AN S 320; AN S 331; AN S 352*

Factors that affect managers of a companion animal enterprise.

Financial and business goal identification, problem clarification, behavior modification, animal training, humane education, and resource allocation to manage a companion animal system.

**AN S 425: Swine Systems Management**

(2-2) Cr. 3. F.

*Prereq: (AN S 225; AN S 270; AN S 270L; AN S 319; AN S 320; AN S 331; AN S 352) or Permission of Instructor*

Decisions facing the administrator of a swine enterprise. Financial and production goal identification, problem clarification, and resource allocation to manage the swine enterprise. ECON 230 or equivalent recommended.

**AN S 426: Beef Cattle Systems Management**

(2-2) Cr. 3. F.S.

*Prereq: (AN S 226; AN S 270; AN S 270L; AN S 320) or Permission of Instructor*

Decisions facing the administrator of a beef cow-calf or feedlot enterprise. Financial and production goal identification, problem clarification, and resource allocation to manage the beef enterprise. Computer aided study. ECON 230 or equivalent recommended.

**AN S 429: Sheep Systems Management**

(2-2) Cr. 3. S.

*Prereq: (AN S 229; AN S 319; AN S 320; AN S 331; AN S 352) or Permission of Instructor*

Decisions facing the administrator of a sheep enterprise. Financial and production goal identification, problem clarification, and resource allocation to manage the sheep enterprise. ECON 230 and AGRON 334 or equivalents recommended.

**AN S 434: Dairy Systems Management**

(2-2) Cr. 3. F.

*Prereq: AN S 235; AN S 331; AN S 320; AN S 337; AN S 352*

The scientific foundation of dairy cattle management. The impact of dairy farm management practices on the biological processes of the cow. Integrates concepts from the disciplines of lactation, reproduction, nutrition, genetics, and animal health.

**AN S 435: Applied Dairy Farm Evaluation**

(2-2) Cr. 3. S.

*Prereq: AN S S 434*

Evaluate nutrition, reproduction, milk quality, breeding, and related management practices of commercial dairy herds in a case study format. Students will apply knowledge gained in the classroom to commercial dairy farm situations and develop skills in information gathering, decision making, problem solving, and interpersonal communications. ECON 230 or equivalent recommended.

**AN S 441: International Animal Agriculture**

(Cross-listed with GLOBE). (3-0) Cr. 3. S.

*Prereq: AN S 223 or AN S 225 or AN S 226 or AN S 229 or AN S 235*

An overview of animal agriculture with emphasis in developing countries. Historical, economic, environmental, and political considerations will be assessed and evaluated. Issues related to gender, resilience and sustainability for different production systems including alternative livestock species, will be investigated. The role of animal source foods in attainment of global food security will be discussed.

Meets International Perspectives Requirement.

**AN S 460: Science and Technology of Value Added Meat Products**

(Dual-listed with AN S 560). (2-2) Cr. 3. S.

*Prereq: AN S 270*

Physical, chemical and biological properties of meat important to achieving value-added meat product characteristics. Ingredients, technology and equipment used for processing, preservation and safety of cured meats, loaf products and fresh, cooked, dry and semi-dry sausage products.

**AN S 473A: Poultry Enterprise Management**

Cr. 3. SS.

*Prereq: (CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or BIOL 212)*

Business and management aspects of the poultry industry. Emphasis on personal interactions, effective communication, interview skills, poultry management, writing a business plan, and business decisions. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

**AN S 473B: Breeder Flock and Hatchery Management**

Cr. 3. SS.

*Prereq: (CHEM 163 or CHEM 167 or CHEM 177); (BIOL 211 or BIOL 212)*

Topics associated with the management of poultry breeder flocks and hatcheries: nutrition, lighting management, reproductive physiology, and husbandry for breeder flocks. Embryology, incubation techniques, biosecurity, and hatchery management. 2-week course. Enrollment restricted to participants in the Midwest Poultry Consortium Center of Excellence Scholarship/Internship program.

**AN S 475: Intercollegiate Judging Training and Competition**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation and grading of livestock, livestock products, and livestock/domesticated animal production management plans. Development and advancement of decision-making skills, comparative techniques, and presentation of oral or written reasons or analyses. Maximum of 6 credits may be applied toward graduation. Maximum of 6 credits may be applied toward graduation.

**AN S 475A: Intercollegiate Judging Training and Competition: Meat Animals**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation and grading of livestock. Development and advancement of decision-making skills, comparative techniques and terminology, familiarity with anatomical terms/structures, and presentation of oral reasons. Maximum of 6 credits may be applied toward graduation. Maximum of 6 credits may be applied toward graduation.

**AN S 475B: Intercollegiate Judging Training and Competition: Dairy Cattle**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation of dairy cattle, in particular heifers and lactating dairy cows. Development and advancement of decision-making skills, comparative techniques and terminology, familiarity with anatomical terms/structures, and presentation of oral reasons. Maximum of 6 credits may be applied toward graduation.

**AN S 475C: Intercollegiate Judging Training and Competition: Meats**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation and grading of livestock/meat products. Development and advancement of decision-making skills, comparative techniques and terminology, familiarity with anatomical terms/structures, and presentation of written reasons. Maximum of 6 credits may be applied toward graduation.

**AN S 475D: Intercollegiate Judging Training and Competition: Meat Animal Evaluation**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation and grading of livestock, livestock products, and livestock production management plans. Emphasis placed on the impact of management decisions on marketability and profitability. Development and advancement of decision-making skills, and communication and comparative techniques. Maximum of 6 credits may be applied toward graduation.

**AN S 475E: Intercollegiate Judging Training and Competition: Horses**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation of horses and horse events. Emphasis placed on familiarity with anatomical terms/structures, form to function, application of breed association rules and current maneuver scoring, and the use of comparative terminology. Development and advancement of decision-making skills, comparative techniques, and presentation of oral reasons. Maximum of 6 credits may be applied toward graduation.

**AN S 475F: Intercollegiate Judging Training and Competition: Management Systems**

(0-4) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Specialized training in evaluation of livestock/domesticated animal production management plans. Development and advancement of decision-making skills, comparative techniques, and presentation of analyses. Emphasis placed on the impact of management decisions on marketability and profitability. Maximum of 6 credits may be applied toward graduation.

**AN S 480: Animal Industry Leadership Fellows**

Cr. 1. Repeatable. F.S.

*Prereq: AN S 225; AN S 226; Permission of Instructor*

Students broaden their perspective of the livestock industry through site visits, case-study (Fellows) projects, and cooperative learning experiences that capitalize on interaction skills in the context of studying the structure of the U.S. livestock industry. This for-credit offering represents the central academic focus of the Iowa State University Animal Industry Leadership Fellows Program. Study is species specific, and enrollment is limited. Offered on a satisfactory-fail basis only.

**AN S 480A: Animal Industry Leadership Fellows: Beef**

Cr. 1. Repeatable. F.S.

*Prereq: AN S 226; Permission of Instructor*

Students broaden their perspective of the livestock industry through site visits, case-study (Fellows) projects, and cooperative learning experiences that capitalize on interaction skills in the context of studying the structure of the U.S. livestock industry. This for-credit offering represents the central academic focus of the Iowa State University Animal Industry Leadership Fellows Program. Study is species specific, and enrollment is limited. Offered on a satisfactory-fail basis only.

**AN S 480C: Animal Industry Leadership Fellows: Pork**

Cr. 1. Repeatable. F.S.

*Prereq: AN S 225; Permission of Instructor*

Students broaden their perspective of the livestock industry through site visits, case-study (Fellows) projects, and cooperative learning experiences that capitalize on interaction skills in the context of studying the structure of the U.S. livestock industry. This for-credit offering represents the central academic focus of the Iowa State University Animal Industry Leadership Fellows Program. Study is species specific, and enrollment is limited. Offered on a satisfactory-fail basis only.

**AN S 480G: Animal Industry Leadership Fellows: Poultry**

Cr. 1. Repeatable. F.S.

*Prereq: AN S 223; Permission of Instructor*

Students broaden their perspective of the livestock industry through site visits, case-study (Fellows) projects, and cooperative learning experiences that capitalize on interaction skills in the context of studying the structure of the U.S. livestock industry. Central academic focus of the Iowa State University Animal Industry Leadership Fellows Program. Study is species specific, and enrollment is limited. Offered on a satisfactory-fail basis only.

**AN S 489: Issues in Food Safety**

(Cross-listed with FS HN, HSP M, VDPAM). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**AN S 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of An S 490 may be applied toward the total credits required for graduation.

**AN S 490A: Independent Study: Animal Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of An S 490 may be applied toward the total credits required for graduation.

**AN S 490B: Independent Study: Dairy Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490C: Independent Study: Meat Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490D: Independent Study: Companion Animal Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490E: Independent Study: Equine Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490G: Independent Study: Poultry Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 490I: Independent Study: Entrepreneurship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Open to undergraduate students in animal science, dairy science and general pre-veterinary medicine showing satisfactory preparation for project chosen. Individual projects involving faculty supervision, including mentoring and preparation of report. A maximum of 6 credits of AN S 490 may be applied toward the total credits required for graduation.

**AN S 493: Workshop in Animal Science**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Workshop in livestock production. Includes current concepts in breeding, nutrition, reproduction, meats, and technologies that impact the animal industry.

**AN S 495: Agricultural Travel Course Preparation**

Cr. R. Repeatable. F.S.

*Prereq: Permission of Instructor*

Limited enrollment. Students enrolled in this course will also register for Agron 495 and intend to register in Agron 496 and An S 496 the following term. Topics will include the agricultural industries, climate, crops, culture, history, livestock, marketing, soils, and preparation for travel to locations to be visited. Information normally available 9 months before departure.

**AN S 496: Agricultural Travel Course**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. International or domestic tour and study of livestock production systems and impacts of animals on society and the ecosystem. Influence of climate, economics, geography, landscapes, markets, and other factors on both livestock and other domesticated animals. Locations and duration of tours will vary. Information usually available 9 months before departure. Tour expenses paid by students.

**AN S 496A: Agricultural Travel Course: International Tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. International tour and study of livestock production systems and impacts of animals on society and the ecosystem. Influence of climate, economics, geography, landscapes, markets, and other factors on both livestock and other domesticated animals. Locations and duration of tours will vary. Information usually available 9 months before departure. Tour expenses paid by students. Meets International Perspectives Requirement.

**AN S 496B: Agricultural Travel Course: Domestic tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Limited enrollment. Domestic tour and study of livestock production systems and impacts of animals on society and the ecosystem. Influence of climate, economics, geography, landscapes, markets, and other factors on both livestock and other domesticated animals. Locations and duration of tours will vary. Information usually available 9 months before departure. Tour expenses paid by students.

**AN S 497: Undergraduate Teaching Experiences in Animal Science**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor*

Development of oral and written communication skills of technical concepts in animal science. Emphasis on organizational skills, conducting activities and interpersonal communication skills. Responsibilities in a class under direct supervision of a faculty member. A maximum of 4 credits of An S 497 may be applied toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AN S 500: Applied Data Science and Statistics using Statistical Software in Animal Sciences**

(2-0) Cr. 1. F.

*Prereq: Credit or enrollment in STAT 587 or equivalent*

Introduction to using SAS and R for solving research problems, including organization of data files, transfer of files between different formats, data editing, identifying confounded data, developing statistical models, and techniques for analysis of designed experiments. (1 credit each for 500A and 500B).



**AN S 500A: Applied Data Science and Statistics using Statistical Software in Animal Sciences: SAS**

(2-0) Cr. 1. F.

*Prereq: Credit or enrollment in STAT 587 or equivalent*

First half semester course. Introduction to using SAS for solving research problems, including organization of data files, transfer of files between different formats, data editing, identifying confounded data, developing statistical models, and techniques for analysis of designed experiments.

**AN S 500B: Applied Data Science and Statistics using Statistical Software in Animal Sciences: R**

(2-0) Cr. 1. F.

*Prereq: Credit or enrollment in STAT 587 or equivalent*

Second half semester course. Introduction to using R for data science and statistics to solve research problems, including data entry, data management, merging files, outputting new datasets and reports, data visualization, developing statistical models, and techniques for analysis of designed experiments.

**AN S 501: Survey of Animal Disciplines**

(1-0) Cr. 1. F.

Required for Animal Science graduate students. Orientation to departmental and graduate school policies and procedures. Discussion of programs of research and outreach in Animal Science. Issues impacting the animal industry. Offered on a satisfactory-fail basis only.

**AN S 515: Integrated Crop and Livestock Production Systems**

(Cross-listed with A B E, AGRON, SUSAG). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SUSAG 509*

Methods to maintain productivity and minimize the negative ecological effects of agricultural systems by understanding nutrient cycles, managing manure and crop residue, and utilizing multispecies interactions. Crop and livestock production within landscapes and watersheds is also considered. Course includes a significant field component, with student teams analyzing Iowa farms.

**AN S 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with FS HN, MICRO, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**AN S 518: Digestive Physiology and Metabolism of Non Ruminants**

(Cross-listed with NUTRS). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AN S 419 or NUTRS 501*

Digestion and metabolism of nutrients. Nutritional requirements and current research and feeding programs for poultry and swine.

**AN S 520: Digestive Physiology and Metabolism of Ruminants**

(Cross-listed with NUTRS). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: AN S 419 or NUTRS 501*

Digestive physiology and nutrient metabolism in ruminant and preruminant animals.

**AN S 533: Physiology and Endocrinology of Animal Reproduction**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: General physiology course*

Development of structure and function of the reproductive system. Physiologic and endocrine aspects including puberty, gametogenesis, estrous cycle, pregnancy, maternal recognition, fertilization and early embryonic development.

**AN S 536: Perinatology**

(2-0) Cr. 2. S.

*Prereq: One course in physiology; one course in biochemistry*

Regulation of metabolism and development in the mammalian fetus and neonate is explored in a comparative manner. Emphasis will be on the dynamic changes in these relationships occurring at birth.

**AN S 537: Topics in Animal Behavior, Welfare**

(3-0) Cr. 3.

*Prereq: permission of instructor; M.S. or Ph.D. student*

Each semester, the students' focus is on different topics related to animal behavior, animal welfare and contemporary issues related to animal behavior and welfare. Each topic is separate and distinct, and students may enroll in multiple topics. This is an on-line course only. Each topic may be taken only one time for credit.

**AN S 537A: Topics in Animal Behavior, Welfare: Animal Behavior**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: permission of instructor; M.S. or Ph.D. student*

Each semester, the students' focus is on different topics related to animal behavior, animal welfare and contemporary issues related to animal behavior and welfare. Each topic is separate and distinct, and students may enroll in multiple topics. This is an on-line course only. Each topic may be taken only one time for credit.

**AN S 537B: Topics in Animal Behavior, Welfare: Contemporary Issues.**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: permission of instructor; M.S. or Ph.D. student*

Each semester, the students' focus is on different topics related to animal behavior, animal welfare and contemporary issues related to animal behavior and welfare. Each topic is separate and distinct, and students may enroll in multiple topics. This is an on-line course only. Each topic may be taken only one time for credit.

**AN S 537C: Topics in Animal Behavior, Welfare: Animal Welfare**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: permission of instructor; M.S. or Ph.D. student*

Each semester, the students' focus is on different topics related to animal behavior, animal welfare and contemporary issues related to animal behavior and welfare. Each topic is separate and distinct, and students may enroll in multiple topics. This is an on-line course only. Each topic may be taken only one time for credit.

**AN S 537D: Topics in Animal Behavior, Welfare: Immune and Stress**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: permission of instructor; M.S. or Ph.D. student*

Each semester, the students' focus is on different topics related to animal behavior, animal welfare and contemporary issues related to animal behavior and welfare. Each topic is separate and distinct, and students may enroll in multiple topics. This is an on-line course only. Each topic may be taken only one time for credit.

**AN S 540: Livestock Immunogenetics**

(Cross-listed with MICRO, V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: AN S 561 or MICRO 575 or V MPM 520*

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

**AN S 549: Advanced Vertebrate Physiology I**

(Cross-listed with KIN, NUTRS). (4-0) Cr. 4. F.

*Prereq: recommended: an undergraduate physiology course and a biochemistry course*

Overview of mammalian physiology. Cell biology, endocrinology, cardiovascular, respiratory, immune, digestive, skeletal muscle and reproductive systems.

**AN S 556: Current Topics in Genome Analysis**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BBMB 405 or GDCB 510*

Introduction to principles and methodology of molecular genetics useful in analyzing and modifying large genomes.

**AN S 560: Science and Technology of Value Added Meat Products**

(Dual-listed with AN S 460). (2-2) Cr. 3. S.

*Prereq: AN S 270*

Physical, chemical and biological properties of meat important to achieving value-added meat product characteristics. Ingredients, technology and equipment used for processing, preservation and safety of cured meats, loaf products and fresh, cooked, dry and semi-dry sausage products.

**AN S 561: Population and Quantitative Genetics for Breeding**

(Cross-listed with AGRON). (4-0) Cr. 4. F.

*Prereq: STAT 587*

Population and quantitative genetics for plant and animal genetics. Study of the genetic basis and analysis of variation in quantitative traits in domestic or experimental populations using phenotypic and molecular marker data, including estimation of heritability and other genetic parameters, linkage analysis and mapping of quantitative trait loci, and the impact of inbreeding, heterosis, and genotype-by-environment interaction.

**AN S 562: Methodologies for Population/Quantitative Genetics**

(2-0) Cr. 2. S.

*Prereq: AN S 561, STAT 402*

Basic theory for genetic analysis of animal breeding data. Course A (1st half semester) covers linear models, selection index methods, and basic theory for best linear unbiased prediction. Course B (2nd half semester) best linear unbiased prediction, including genetic groups, environmental adjustment, repeated records, multiple trait models, maternal effects models, and theory for maximum likelihood estimation of genetic parameters.

**AN S 562A: Methodologies for Population/Quantitative Genetics: Linear Models and Genetic Prediction**

(2-0) Cr. 2. S.

*Prereq: AN S 561, STAT 402*

Basic theory for genetic analysis of animal breeding data. Course A (1st half semester) covers linear models, selection index methods, and basic theory for best linear unbiased prediction. Course B (2nd half semester) best linear unbiased prediction, including genetic groups, environmental adjustment, repeated records, multiple trait models, maternal effects models, and theory for maximum likelihood estimation of genetic parameters.

**AN S 562B: Methodologies for Population/Quantitative Genetics:****Advanced Genetic Prediction&Parameter Estimation**

(2-0) Cr. 2. S.

*Prereq: AN S 561, STAT 402*

Basic theory for genetic analysis of animal breeding data. Course A (1st half semester) covers linear models, selection index methods, and basic theory for best linear unbiased prediction. Course B (2nd half semester) best linear unbiased prediction, including genetic groups, environmental adjustment, repeated records, multiple trait models, maternal effects models, and theory for maximum likelihood estimation of genetic parameters.

**AN S 563: Advanced Processed Meats Technology**

Cr. 3. S.

*Prereq: AN S 270 or equivalent, or at least two undergraduate courses in biology, food science, microbiology or culinology*

Physical, chemical and biological properties of meat important to processed meat product characteristics. Ingredients, technology and equipment used for fresh and cured meat products. Packaging, preservation and food safety issues critical to processed meat products are emphasized.

**AN S 569: Reproductive and Developmental Toxicology**

(Cross-listed with TOX). Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BBMB 301, BIOL 258 or An S 331*

Chemical agents that target developmental and reproductive systems in animals and humans, both male and female. The influence that timeline of developmental in utero and what part of reproductive organ have on outcome of environmental exposures will be developed. The physiological changes due to exposure, and mechanistic pathways activated by xenobiotics will be defined and the consequences of these changes will be explored.

**AN S 570: Advanced Meat Science and Applied Muscle Biology**

(2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: AN S 460 or equivalent*

Ante and postmortem factors impacting composition, structure, and chemistry of red meat and poultry muscle/meat, the conversion of muscle to meat, and the sensory and nutritional attributes of fresh meats. Oral reports and a written project. Students cannot receive credit for both AN S 570 and AN S 573

**AN S 571: Advanced Meat Processing Principles and Technology**

(2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AN S 460 or AN S 570*

Physical/chemical relationships during processing. Effects of modern technology, non-meat additives and preservation techniques on quality and safety of processed meat. Laboratory demonstration of principles and technology.

**AN S 573: Fresh Meat Science and Technology**

Cr. 3. F.

*Prereq: AN S 270 or equivalent, or minimum two undergraduate courses in biology, food science, microbiology or culinology.*

Quality, and sensory attributes of fresh meats and how they develop and how they are evaluated. The study of ante and postmortem factors impacting quantity, composition, structure, and chemistry of red meat and poultry muscle/meat. Students cannot receive credit for both AN S 570 and AN S 573

**AN S 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590A: Special Topics: Animal Breeding**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590B: Special Topics: Animal Nutrition**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590C: Special Topics: Meat Animal Production**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590D: Special Topics: Dairy Production**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590E: Special Topics: Meat Science**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590F: Special Topics: Physiology of Reproduction**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590G: Special Topics: Muscle Biology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590H: Special Topics: Poultry Nutrition**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590I: Special Topics: Poultry Products**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590J: Special Topics: Experimental Surgery**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590K: Special Topics: Professional Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590L: Special Topics: Teaching**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590M: Special Topics: Molecular Biology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 590N: Special Topics: Ethology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Special topics in the animal sciences, offered on demand and may be conducted by guest professors.

**AN S 599: Creative Component**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AN S 599A: Creative Component: Animal Breeding and Genetics**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AN S 599B: Creative Component: Animal Nutrition**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AN S 599C: Creative Component: Animal Physiology**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AN S 599D: Creative Component: Animal Science**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**AN S 599E: Creative Component: Meat Science**

Cr. 1-8. F.S.SS.

*Prereq: Nonthesis M.S*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

**Courses for graduate students:****AN S 603: Seminar in Animal Nutrition**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor*

Discussion of current literature; preparation and submission of abstracts.

**AN S 618: Vitamins and Minerals**

(Cross-listed with NUTRS). Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Biochemistry, physiology, basic nutrition*

Understanding molecular aspects of vitamin and mineral metabolism and homeostasis in humans and animals. An in-depth examination of the chemistry of vitamins and minerals, including genetic mutations, proteins involved in absorption and excretion, and their necessity in biological processes.

**AN S 619: Advanced Nutrition and Metabolism - Protein**

(Cross-listed with NUTRS). (2-0) Cr. 2. F.

*Prereq: BBMB 405*

Digestion, absorption, and intermediary metabolism of amino acids and protein. Regulation of protein synthesis and degradation. Integration of cellular biochemistry and physiology of mammalian protein metabolism.

**AN S 620: Advanced Nutrition and Metabolism - Energy**

(Cross-listed with NUTRS). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405*

Energy constituents of feedstuffs and energy needs of animals as related to cellular biochemistry and physiology. Interpretations of classical and current research.

**AN S 633: Seminar in Animal Reproduction**

(1-0) Cr. 1. Repeatable. F.

*Prereq: Permission of instructor*

Discussion of current literature and preparation of reports and seminars on selected topics concerning animal physiology.

**AN S 652: Animal Breeding Strategies**

(2-0) Cr. 2.

*Prereq: AN S 561*

Basic concepts and methods for design and evaluation of genetic improvement programs for livestock. Topic A. (1st half semester) Prediction of response to selection, selection index theory, multiple trait selection, inbreeding, crossbreeding, and marker-assisted selection. Topic B. (2nd half semester) Advanced concepts in design and evaluation of animal breeding programs, including modeling and optimization, derivation of economic values, gene-flow, and predicting rates of inbreeding. Each topic may be taken only one time for academic credit.

**AN S 652A: Animal Breeding Strategies: Breeding Goals and Response to Selection**

(2-0) Cr. 2.

*Prereq: AN S 561*

Basic concepts and methods for design and evaluation of genetic improvement programs for livestock. Topic A. (1st half semester) Prediction of response to selection, selection index theory, multiple trait selection, inbreeding, crossbreeding, and marker-assisted selection. Topic B. (2nd half semester) Advanced concepts in design and evaluation of animal breeding programs, including modeling and optimization, derivation of economic values, gene-flow, and predicting rates of inbreeding. Each topic may be taken only one time for academic credit.

**AN S 652B: Animal Breeding Strategies: Design and Evaluation of Animal Breeding Programs**

(2-0) Cr. 2.

*Prereq: AN S 561*

Basic concepts and methods for design and evaluation of genetic improvement programs for livestock. Topic A. (1st half semester) Prediction of response to selection, selection index theory, multiple trait selection, inbreeding, crossbreeding, and marker-assisted selection. Topic B. (2nd half semester) Advanced concepts in design and evaluation of animal breeding programs, including modeling and optimization, derivation of economic values, gene-flow, and predicting rates of inbreeding. Each topic may be taken only one time for academic credit.

**AN S 653: Applied Animal Breeding Strategies**

(3-0) Cr. 3. F.

*Prereq: AN S 561 recommended*

Industrial applications of breeding systems, selection methods, and new genetic technologies. One or more field trips to an industry breeding company.

**AN S 655: Advanced Computational Methods in Animal Breeding and Genetics**

(3-1) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: AN S 500, AN S 562, COM S 207*

Computational methods and strategies for analysis of large data sets with animal breeding data for use in research and industry applications. Course A (1st half semester) Strategies for handling large sets and for prediction using best linear unbiased prediction using a formal language and utility programs. Course B (2nd half semester) Strategies for estimation of genetic parameters and for use of non-linear models for genetic analysis of categorical and survival type data.

**AN S 655A: Computational Strategies for Predicting Breeding Values**

(3-1) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: AN S 500, AN S 562, COM S 207*

Computational methods and strategies for analysis of large data sets with animal breeding data for use in research and industry applications. Strategies for handling large sets and for prediction using best linear unbiased prediction using a formal language and utility programs.

**AN S 655B: Computational Strategies for Genetic Parameter Estimation**

(3-1) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: AN S 500, AN S 562, COM S 207*

Computational methods and strategies for analysis of large data sets with animal breeding data for use in research and industry applications. Strategies for estimation of genetic parameters and for use of non-linear models for genetic analysis of categorical and survival type data.

**AN S 656: Statistical Methods for Mapping Quantitative Trait Loci**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: AN S 562, STAT 447*

Statistical methods for mapping quantitative trait loci in out-bred populations. Methods based on modeling covariances between relatives. Likelihood based methods using half-sib and full-sib families and extended pedigrees. Bayesian methods applied.

**AN S 658: Seminar in Animal Breeding and Genetics**

(1-0) Cr. 1. Repeatable. F.S.

Presentation of current research related to animal breeding and genetics.

**AN S 670: Molecular Biology of Muscle**

(Cross-listed with KIN). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BBMB 405, BBMB 420*

Ultrastructure of muscle; chemistry, structure, function, and molecular biology of muscle proteins. Molecular aspects of muscle contraction, development and turnover. Cytoskeletal proteins and dynamics.

**AN S 684: Seminar in Meat Science**

(1-0) Cr. 1. Repeatable. S.

*Prereq: Permission of instructor*

Discussion and evaluation of current topics in research publications in meat science.

**AN S 685: Seminar in Muscle Biology**

(1-0) Cr. 1. Repeatable. S.

*Prereq: Permission of instructor*

Reports and discussion of recent literature and current investigations.

**AN S 695: Seminar in Animal Science**

(1-0) Cr. 1. Repeatable. S.

Reports and discussion of current issues and research in animal science. One credit is required for all M.S. degree candidates with graduate majors in the Department of Animal Science, and two credits are required for all Ph.D. candidates with graduate majors in the Department of Animal Science. Offered on a satisfactory-fail basis only.

**AN S 699: Research**

Cr. arr. Repeatable.

**AN S 699A: Research: Animal Breeding**

Cr. arr. Repeatable.

**AN S 699B: Research: Animal Nutrition**

Cr. arr. Repeatable.

**AN S 699C: Research: Meat Animal Production**

Cr. arr. Repeatable.

**AN S 699D: Research: Dairy Production**

Cr. arr. Repeatable.

**AN S 699E: Research: Meat Science**

Cr. arr. Repeatable.

**AN S 699F: Research: Physiology of Reproduction**

Cr. arr. Repeatable.

**AN S 699G: Research: Muscle Biology**

Cr. arr. Repeatable.

**AN S 699H: Research: Poultry Nutrition**

Cr. arr. Repeatable.

**AN S 699I: Research: Poultry Products**

Cr. arr. Repeatable.

**AN S 699J: Research: Animal Ethology**

Cr. arr. Repeatable.

## Anthropology (ANTHR)

*Any experimental courses offered by ANTHR can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****ANTHR 201: Introduction to Cultural Anthropology**

(3-0) Cr. 3. F.S.SS.

Introduction to the core concepts, theories, and methods of cultural anthropology with an emphasis on understanding human cultural diversity in global society from an anthropological perspective.

Meets International Perspectives Requirement.

**ANTHR 202: Human Origins**

(3-0) Cr. 3. F.S.

Human biological and cultural evolution; survey of the evidence from fossil primates, the human fossil record and the archaeological record, as well as living primates; introduction to research methods in archaeology and biological anthropology.

**ANTHR 210: Introduction to Asian American Studies**

(Cross-listed with WLC). (3-0) Cr. 3.

An interdisciplinary and chronological examination of Asian American immigration experiences from the early 19th century to the 21st century. Focus on how these immigration histories are accompanied by changing racial constructions. Discussion of racial stereotyping, the model minority myth, identity development, and efforts for social justice.

Meets U.S. Diversity Requirement



**ANTHR 220: Globalization and Sustainability**

(Cross-listed with ENV S, GLOBE, M E, MAT E, SOC). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**ANTHR 225: American Indians of Iowa**

(Cross-listed with AM IN). Cr. 3. F.

Cultures and histories of Native people who have called the present state of Iowa home; primary focus on the period between 1700 CE and the present; Native interactions with Spanish, French, British, and American people.

**ANTHR 230: Globalization and the Human Condition**

(3-0) Cr. 3. F.S.

An introduction to understanding key global issues in the contemporary world. Focuses on social relations, cultural practices and political-economic linkages among Africa, the Americas, Asia, Europe and the Pacific.

Meets International Perspectives Requirement.

**ANTHR 306: Culture and Interpretation**

(3-0) Cr. 3. S.

*Prereq: ANTHR 201*

Disciplinary and interdisciplinary approaches to the interpretation of contemporary and historical cultures, their contexts, and meanings.

Meets International Perspectives Requirement.

**ANTHR 307: Biological Anthropology**

(2-2) Cr. 3. S.

*Prereq: ANTHR 202*

Human evolution as known from fossil evidence, comparative primate studies, and genetic variations in living populations. Laboratory-tutorial sessions include study and discussion of human osteology, fossil hominids, simple Mendelian traits, and bio-ethics in applied biological anthropology.

**ANTHR 308: Archaeology**

(2-2) Cr. 3. F.

*Prereq: ANTHR 202*

Methods and techniques for the recovery and interpretation of archaeological evidence, its role in reconstructing human behavior and past environments. Laboratory sessions include experience in the interpretation of archaeological evidence, the use of classification systems, and prehistoric technologies such as ceramics and stone tools.

**ANTHR 309: Introduction to Culture and Language**

(Cross-listed with LING). (3-0) Cr. 3.

Introduction to study of language, culture and society from an anthropological perspective. Focus on language and thought, ethnography of speaking, discourse and narrative, writing and literacy, and media communication. Discussion of key theories and methods of linguistic anthropology. ANTHR 201 recommended.

Meets International Perspectives Requirement.

**ANTHR 310: Environmental Anthropology**

(3-0) Cr. 3.

*Prereq: ANTHR 201*

Exploration of contemporary theories and methods in environmental anthropology with a focus on anthropological approaches to the global climate crisis.

Meets International Perspectives Requirement.

**ANTHR 313: Kinship and Marriage in a Global Perspective**

(Dual-listed with ANTHR 513). (3-0) Cr. 3. S.

Comparative and historical overview of the family, marriage and kinship.

Examination of cross-cultural differences in the construction and functioning of family and kin relations; role of kinship in structuring individual and collective activities; current critical and theoretical issues in kinship studies, especially integrating work on gender and sexuality.

ANTHR 201 recommended.

Meets International Perspectives Requirement.

**ANTHR 315: Archaeology of North America**

(Dual-listed with ANTHR 515). (Cross-listed with AM IN). (3-0) Cr. 3. S.

*Prereq: ANTHR 202*

Prehistory and early history of North America as reconstructed from archaeological evidence; peopling of the New World; culture- historical sequences of major culture areas; linkages of archaeological traditions with selected ethnohistorically known Native American groups.

**ANTHR 317: Primate Behavior, Ecology, and Evolution**

(3-0) Cr. 3. F.S.SS.

An overview of the primates (prosimians, monkeys, and apes) with a focus on their behavior from an ecological and evolutionary perspective. Topics include: methods in primatological research; survey of the living primates; biological and social adaptations of primates; interactions between primates and their environment; and primate conservation. ANTHR 202 and/or basic biology course recommended.

**ANTHR 319: Skeletal Biology**

(Dual-listed with ANTHR 519). (2-2) Cr. 3. S.

*Prereq:* ANTHR 307 or 3 credits in BIOL

Comprehensive study of the skeletal anatomy, physiology, genetics, growth, development and population variation of the human skeleton. Applications to forensic anthropology, paleopathology and bioarchaeology are introduced.

**ANTHR 320: Great Plains Archaeology**

(Dual-listed with ANTHR 520). (Cross-listed with AM IN). (3-0) Cr. 3. F.

*Prereq:* ANTHR 202

Prehistoric societies of the Great Plains region of North America, from initial occupation to European contact; emphasis on sociocultural changes, continuities, and adaptations to changing environments using archaeological, ecological, ethnographic information.

**ANTHR 321: World Prehistory**

(Dual-listed with ANTHR 521). (3-0) Cr. 3. S.

An introduction to archaeological sites from around the world including the Near East, Africa, Europe, Mesoamerica, and North and South America. Emphasis is on the interpretation of material cultural remains in reconstructing past societies. ANTHR 202 recommended.

**ANTHR 322: Peoples and Cultures of Native North America**

(Dual-listed with ANTHR 522). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq:* AM IN 210 or ANTHR 201

Origin, distribution, and pre-contact life of the indigenous peoples of North America. Survey of culture areas; language families, social and political systems, ecological and economic adaptations, religion and spirituality; impact of European contact; cultural resilience and revitalization in contemporary American Indian life.

**ANTHR 323: Topics in Latin American Anthropology**

(Dual-listed with ANTHR 523). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

**ANTHR 323A: Latin American Anthropology: Violence and Memory**

(Dual-listed with ANTHR 523A). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

**ANTHR 323B: Latin American Anthropology: Social movements and Democracy**

(Dual-listed with ANTHR 523B). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

**ANTHR 323C: Latin American Anthropology: Race, Class and Gender**

(Dual-listed with ANTHR 523C). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

**ANTHR 323D: Latin American Anthropology: Regional Focus**

(Dual-listed with ANTHR 523D). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

**ANTHR 323E: Latin American Anthropology: Culture and Sport.**

(Dual-listed with ANTHR 523E). (Cross-listed with US LS). (3-0) Cr. 3.

Repeatable, maximum of 9 credits.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

**ANTHR 324: Health and Native American Communities**

(Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq:* ENGL 250

Overview of historic and contemporary health and health care in Native Communities. Indian Health Service and specific regulations. Consideration of both cultural and scientific approaches to medicine. Specific health issues (e.g., diabetes, alcoholism, depression, etc.) in American Indian communities.

**ANTHR 328: Archaeological Discovery and Analysis**

(2-2) Cr. 3. Repeatable, maximum of 9 credits. S.

*Prereq: ANTHR 308*

Identification, analysis, and interpretation of animal bones recovered from archaeological sites, emphasizing taphonomy, paleoecology, and faunal exploitation.

**ANTHR 332: Current Issues in Native North America**

(Dual-listed with ANTHR 532). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 332A: Current Issues in Native North America: Gender and Family**

(Dual-listed with ANTHR 532A). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 332B: Current Issues in Native North America: Indigenous Ecologies and Geographies**

(Dual-listed with ANTHR 532B). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 332C: Current Issues in Native North America: Cultural and Political Movements**

(Dual-listed with ANTHR 532C). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 332D: Current Issues in Native North America: Regional Focus**

(Dual-listed with ANTHR 532D). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 335: Peoples and Cultures of the Middle East**

(3-0) Cr. 3.

Anthropological approaches to the study of Middle East cultures. Survey of major culture areas, discussion of economic, political, and social and religious issues and systems. Examination of contemporary social movements. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 336: Culture and Capitalism**

(Dual-listed with ANTHR 536). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: ANTHR 201 or ANTHR 306*

Cross-cultural analysis of current development practices from an anthropological perspective; focus on international aid, development institutions, agrarian reform, indigenous knowledge, humanitarianism and human rights; introduction to main theories of political and economic anthropology.

Meets International Perspectives Requirement.

**ANTHR 340: Magic, Witchcraft, and Religion**

(Dual-listed with ANTHR 540). (Cross-listed with RELIG). (3-0) Cr. 3. S.

*Prereq: ANTHR 201 or ANTHR 306*

Survey of global religious belief and practice from an anthropological perspective. Emphasis on myth and ritual, shamanism, magic, witchcraft, beliefs in spirits, conceptions of the soul, mind and body relationships, and healing and therapeutic practices. Discussion of religious response to dramatic political and social change; effects of globalization on religious practice.

Meets International Perspectives Requirement.

**ANTHR 342: Culture, Sex, and Gender**

(Cross-listed with WGS). (3-0) Cr. 3. S.

Cross-cultural examination of gender and sexuality. Emphasis on global and transnational perspectives. Topics will include varied gender and sexual expressions, status and roles, intersectionality in global or transnational contexts, and the examination of systems of oppression cross-culturally. ANTHR 201 or WGS 201 recommended.

Meets International Perspectives Requirement.

**ANTHR 354: War and the Politics of Humanitarianism**

(Cross-listed with POL S). (3-0) Cr. 3.

Humanitarianism as a system of thought and a system of intervention in conflict and post-conflict situations. Role of humanitarian organizations and actors in addressing human suffering caused by conflict or war.

Military action as a form of humanitarian intervention.

Meets International Perspectives Requirement.

**ANTHR 355: Understanding Sub-Saharan Africa**

(Cross-listed with AF AM). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Sophomore classification*

Survey of economic, social, political and historical processes that have shaped representations of Africa and Africans. Topics include colonialism, globalization, gender and LGBTQ rights, conflict and representations in Western media.

Meets International Perspectives Requirement.

**ANTHR 369: Ancient Egypt**

(Cross-listed with CL ST). (3-0) Cr. 3.

Archaeology and culture of Ancient Egypt from prehistory to Late Antiquity. Exploration of literature, religion, social history, government, and architecture. Discussion of major archaeological sites and methods; examination of interaction with other ancient near eastern and Mediterranean civilizations. Meets International Perspectives Requirements.

Meets International Perspectives Requirement.

**ANTHR 376: Classical Archaeology**

(Cross-listed with CL ST). (3-0) Cr. 3.

Chronological survey of the material culture of the ancient Graeco-Roman world and the role of archaeological context in understanding the varied aspects of ancient Greek or Roman culture. Among other topics, economy, architecture, arts and crafts, trade and exchange, religion and burial customs will be explored.

Meets International Perspectives Requirement.

**ANTHR 376A: Classical Archeology: Bronze Age and Early Iron Age Greece**

(Cross-listed with CL ST). (3-0) Cr. 3.

An examination of the material culture of Bronze Age and Early Iron Age Greece (ca 3000-700 BCE) and the role of archaeological context in understanding the varied aspects of the cultures that flourished in the region. Primary focus on the urbanized palatial centers that emerged on the island of Crete (Minoan) and in mainland Greece (Mycenaean). Topics include the emergence of social complexity, cultural and technological changes, religious systems, and methods of interpretation.

Meets International Perspectives Requirement.

**ANTHR 376B: Classical Archeology: Archaic through Hellenistic Greece (ca 700-30 BCE)**

(Cross-listed with CL ST). (3-0) Cr. 3.

An examination of the material culture of ancient Greece from ca. 700-30 BCE and the role of archaeological context in understanding the varied aspects of Greek culture found in cities, rural areas, and sanctuaries during the Archaic, Classical, and Hellenistic periods. Topics include urbanization and the rise of the polis, sanctuaries and their offerings, engagement with the wider Mediterranean, and developments in the ways that the Greeks conceptualized and represented their world.

Meets International Perspectives Requirement.

**ANTHR 376C: Classical Archaeology: Roman Archaeology (ca 1000 BCE-400 CE)**

(Cross-listed with CL ST). (3-0) Cr. 3.

An examination of major developments in architecture, sculpture, painting, and other arts of the ancient Roman world and the role of archaeological context in understanding various aspects of Roman culture. Topics include art in the service of social ideology and political propaganda; interactions between the Etruscans, Greeks, and Romans; and the relationship between Rome and its provinces.

Meets International Perspectives Requirement.

**ANTHR 389: Exhibiting Religion**

(Cross-listed with RELIG). (3-0) Cr. 3.

Display of religion in museums, fairs, and exhibitions. History and ethics of museum collecting, storage, display, public engagement, and repatriation. Visit local museums and explore digital galleries.

**ANTHR 411: Anthropology for Global Professionals**

(Dual-listed with ANTHR 511). (3-0) Cr. 3. F.

*Prereq: ANTHR 201 or ANTHR 306*

Theory and methods for conducting ethnographic research in academic and non-academic settings; application of anthropological knowledge to contemporary cultural, political, economic, environmental and spatial issues; development of skills necessary for professional practice as an anthropologist.

Meets International Perspectives Requirement.

**ANTHR 419: Topics in Cultural Anthropology**

(3-0) Cr. 3.

*Prereq: ANTHR 306*

In-depth study of current topics in cultural anthropology, such as recent theoretical trends, new methodologies, or new research on a specific region. Topics vary each time offered. Each section may be taken once for credit up to 9 credits. No more than 9 credits of ANTHR 419 courses may be applied towards graduation.

**ANTHR 419A: Topics in Cultural Anthropology: Theory**

(3-0) Cr. 3.

*Prereq: ANTHR 306*

In-depth study of current topics in cultural anthropology, such as recent theoretical trends, new methodologies, or new research on a specific region. Topics vary each time offered. No more than 9 credits of ANTHR 419 courses may be applied towards graduation.

**ANTHR 419B: Topics in Cultural Anthropology: Methods**

(3-0) Cr. 3.

*Prereq: ANTHR 306*

In-depth study of current topics in cultural anthropology, such as recent theoretical trends, new methodologies, or new research on a specific region. Topics vary each time offered. No more than 9 credits of ANTHR 419 courses may be applied towards graduation.

**ANTHR 419C: Topics in Cultural Anthropology: Regional Focus**

(3-0) Cr. 3.

*Prereq: ANTHR 306*

In-depth study of current topics in cultural anthropology, such as recent theoretical trends, new methodologies, or new research on a specific region. Topics vary each time offered. No more than 9 credits of ANTHR 419 courses may be applied towards graduation.

**ANTHR 419D: Topics in Cultural Anthropology: Others**

(3-0) Cr. 3.

*Prereq: ANTHR 306*

In-depth study of current topics in cultural anthropology, such as recent theoretical trends, new methodologies, or new research on a specific region. Topics vary each time offered. No more than 9 credits of ANTHR 419 courses may be applied towards graduation.

**ANTHR 424: Forensic Anthropology**

(Dual-listed with ANTHR 524). (2-2) Cr. 3. Alt. S., offered irregularly.

*Prereq: ANTHR 202 or ANTHR 307*

Comprehensive study of forensic anthropology, a specialized subfield of biological anthropology. Emphasis is placed on personal identifications from extremely fragmentary, comingled, burnt, cremated and incomplete skeletal remains. All parameters of forensic study are included as they pertain to anthropology, including human variation, taphonomy, entomology, archaeology, pathology, epidemiology; genetics and the non-biological forensic disciplines. An appreciation for the wide range of medicolegal and bioethical issues will also be gained. ANTHR 319 recommended.

**ANTHR 425: Professional Preparation in Anthropology**

(1-0) Cr. 1. F.

*Prereq: Junior classification; ANTHR major*

Instruction and guidance in the development of professional skills needed for success in academic and non-academic anthropological careers. Topics will include strategies for internship and job searches, creating resumes and CVs, composing personal statements and cover letters, and developing contacts and sources. Offered on a satisfactory-fail basis only.

**ANTHR 429: Topics in Archaeological Laboratory Methods and Techniques: Archaeological Field School**

(Dual-listed with ANTHR 529). Cr. 4-6. SS.

*Prereq: ANTHR 202 or ANTHR 308*

Summer field school for training in archaeological reconnaissance and excavation techniques; documentation and interpretation of archaeological evidence.

**ANTHR 431: Ethnographic Methods**

(Dual-listed with ANTHR 531). (3-0) Cr. 3.

Hands-on training in ethnographic field methods; students will carry out research projects in socio-cultural anthropology, learning a variety of investigative research techniques commonly used in social sciences.

**ANTHR 434: Internship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

Supervised practice in government agencies, museums, and business organizations. Offered on a satisfactory-fail basis only. Not more than 6 credits of internship experience may count towards the major. No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor.

**ANTHR 434A: Internship: Archaeology**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

Supervised practice in government agencies, museums, and business organizations. Offered on a satisfactory-fail basis only. Not more than 6 credits of internship experience may count towards the major. No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor.

**ANTHR 434B: Internship: Cultural Anthropology**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

Supervised practice in government agencies, museums, and business organizations. Offered on a satisfactory-fail basis only. Not more than 6 credits of internship experience may count towards the major. No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor.



**ANTHR 434C: Internship: Biological Anthropology**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

Supervised practice in government agencies, museums, and business organizations. Offered on a satisfactory-fail basis only. Not more than 6 credits of internship experience may count towards the major. No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor.

**ANTHR 434D: Internship: Linguistic Anthropology**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; Department Permission*

Supervised practice in government agencies, museums, and business organizations. Offered on a satisfactory-fail basis only. Not more than 6 credits of internship experience may count towards the major. No credits in Anthr 434 may be used to satisfy Anthropology core courses for majors or for the Anthropology minor.

**ANTHR 445: Biological Field School**

(Dual-listed with ANTHR 545). Cr. 4-6. SS.

*Prereq: ANTHR 202 or BIOL 101*

Summer field school for training in behavioral and ecological methods for primatologists. Proposal, data collection and analyses, and presentation of research topic in primatology.

**ANTHR 450: Approaches in Anthropology**

(3-0) Cr. 3. F.

*Prereq: ANTHR 306*

Examination of key approaches to anthropology and its interrelated sub-fields with a focus on major theoretical and analytical contributions.

**ANTHR 451: Practicum in Anthropology**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ANTHR 201 or ANTHR 202 or ANTHR 308; Permission of Instructor*

Application of methods under actual laboratory and field conditions, including basic data management, synthesis, and analysis.

**ANTHR 451A: Practicum in Anthropology: Archaeology**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ANTHR 201 or ANTHR 202 or ANTHR 308; Permission of Instructor*

Application of methods under actual laboratory and field conditions, including basic data management, synthesis, and analysis.

**ANTHR 451B: Practicum in Anthropology: Cultural Anthropology**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ANTHR 201 or ANTHR 202 or ANTHR 308; Permission of Instructor*

Application of methods under actual laboratory and field conditions, including basic data management, synthesis, and analysis.

**ANTHR 451C: Practicum in Anthropology: Biological Anthropology**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ANTHR 201 or ANTHR 202 or ANTHR 308; Permission of Instructor*

Application of methods under actual laboratory and field conditions, including basic data management, synthesis, and analysis.

**ANTHR 451D: Practicum in Anthropology: Linguistic Anthropology**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: ANTHR 201 or ANTHR 202 or ANTHR 308; Permission of Instructor*

Application of methods under actual laboratory and field conditions, including basic data management, synthesis, and analysis.

**ANTHR 482: Topics in Biological Anthropology**

(Dual-listed with ANTHR 582). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 482A: Topics in Biological Anthropology: Paleoanthropology**

(Dual-listed with ANTHR 582A). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 482B: Topics in Biological Anthropology: Primate Cognition**

(Dual-listed with ANTHR 582B). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 482C: Topics in Biological Anthropology: Primate Conservation**

(Dual-listed with ANTHR 582C). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.



**ANTHR 482D: Topics in Biological Anthropology: Population Genetics and Human Evolution**

(Dual-listed with ANTHR 582D). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**ANTHR 490A: Independent Study: Archaeology**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**ANTHR 490B: Independent Study: Cultural Anthropology**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**ANTHR 490C: Independent Study: Biological Anthropology**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**ANTHR 490D: Independent Study: Linguistic Anthropology**

(Cross-listed with LING). Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**ANTHR 490H: Independent Study: Honors**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ANTHR 503: Biological Anthropology and Archaeology**

(3-0) Cr. 3.

*Prereq: ANTHR 307 and ANTHR 308*

History of biological anthropology and archaeology, current developments and theoretical issues related to major events in human biocultural evolution and world prehistory.

**ANTHR 509: Agroecosystems Analysis**

(Cross-listed with AGRON, SOC, SUSAG). (3-4) Cr. 3. F.

*Prereq: Senior or above classification*

Experiential, interdisciplinary examination of Midwestern agricultural and food systems, emphasizing field visits, with some classroom activities.

Focus on understanding multiple elements, perspectives (agronomic, economic, ecologic, social, etc.) and scales of operation.

**ANTHR 510: Theoretical Dimensions of Cultural Anthropology**

(3-0) Cr. 3. F.

*Prereq: 6 credits in anthropology*

Survey of historical and current developments in topical and theoretical approaches to sociocultural anthropology. Examination and assessment of controversies; new research directions and theoretical approaches.

**ANTHR 511: Anthropology for Global Professionals**

(Dual-listed with ANTHR 411). (3-0) Cr. 3. F.

*Prereq: ANTHR 201 or ANTHR 306*

Theory and methods for conducting ethnographic research in academic and non-academic settings; application of anthropological knowledge to contemporary cultural, political, economic, environmental and spatial issues; development of skills necessary for professional practice as an anthropologist.

Meets International Perspectives Requirement.

**ANTHR 513: Kinship and Marriage in a Global Perspective**

(Dual-listed with ANTHR 313). (3-0) Cr. 3. S.

Comparative and historical overview of the family, marriage and kinship. Examination of cross-cultural differences in the construction and functioning of family and kin relations; role of kinship in structuring individual and collective activities; current critical and theoretical issues in kinship studies, especially integrating work on gender and sexuality.

ANTHR 201 recommended.

Meets International Perspectives Requirement.

**ANTHR 515: Archaeology of North America**

(Dual-listed with ANTHR 315). (3-0) Cr. 3. S.

*Prereq: ANTHR 202*

Prehistory and early history of North America as reconstructed from archaeological evidence; peopling of the New World; culture- historical sequences of major culture areas; linkages of archaeological traditions with selected ethnohistorically known Native American groups.

**ANTHR 519: Skeletal Biology**

(Dual-listed with ANTHR 319). (2-2) Cr. 3. S.

*Prereq: ANTHR 307 or 3 credits in BIOL*

Comprehensive study of the skeletal anatomy, physiology, genetics, growth, development and population variation of the human skeleton. Applications to forensic anthropology, paleopathology and bioarchaeology are introduced.

**ANTHR 520: Great Plains Archaeology**

(Dual-listed with ANTHR 320). (3-0) Cr. 3. F.

*Prereq:* ANTHR 202

Prehistoric societies of the Great Plains region of North America, from initial occupation to European contact; emphasis on sociocultural changes, continuities, and adaptations to changing environments using archaeological, ecological, ethnographic information.

**ANTHR 521: World Prehistory**

(Dual-listed with ANTHR 321). (3-0) Cr. 3. S.

An introduction to archaeological sites from around the world including the Near East, Africa, Europe, Mesoamerica, and North and South America. Emphasis is on the interpretation of material cultural remains in reconstructing past societies. ANTHR 202 recommended.

**ANTHR 522: Peoples and Cultures of Native North America**

(Dual-listed with ANTHR 322). (3-0) Cr. 3.

*Prereq:* AM IN 210 or ANTHR 201

Origin, distribution, and pre-contact life of the indigenous peoples of North America. Survey of culture areas; language families, social and political systems, ecological and economic adaptations, religion and spirituality; impact of European contact; cultural resilience and revitalization in contemporary American Indian life.

**ANTHR 523: Topics in Latin American Anthropology**

(Dual-listed with ANTHR 323). (3-0) Cr. 3. Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

**ANTHR 523A: Latin American Anthropology: Violence and Memory**

(Dual-listed with ANTHR 323A). (3-0) Cr. 3. Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 523B: Latin American Anthropology: Social movements and Democracy**

(Dual-listed with ANTHR 323B). (3-0) Cr. 3. Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 523C: Latin American Anthropology: Race, Class and Gender**

(Dual-listed with ANTHR 323C). (3-0) Cr. 3. Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 523D: Latin American Anthropology: Regional Focus**

(Dual-listed with ANTHR 323D). (3-0) Cr. 3. Repeatable, maximum of 9 credits. S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 523E: Latin American Anthropology: Culture and Sport.**

(Dual-listed with ANTHR 323E). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended. Meets International Perspectives Requirement.

**ANTHR 524: Forensic Anthropology**

(Dual-listed with ANTHR 424). (2-2) Cr. 3. Alt. S., offered irregularly.

*Prereq:* ANTHR 202 or ANTHR 307

Comprehensive study of forensic anthropology, a specialized subfield of biological anthropology. Emphasis is placed on personal identifications from extremely fragmentary, comingled, burnt, cremated and incomplete skeletal remains. All parameters of forensic study are included as they pertain to anthropology, including human variation, taphonomy, entomology, archaeology, pathology, epidemiology; genetics and the non-biological forensic disciplines. An appreciation for the wide range of medicolegal and bioethical issues will also be gained. ANTHR 319 recommended.

**ANTHR 529: Topics in Archaeological Laboratory Methods and Techniques: Archaeological Field School**

(Dual-listed with ANTHR 429). Cr. 4-6. SS.

*Prereq:* ANTHR 202 or ANTHR 308

Summer field school for training in archaeological reconnaissance and excavation techniques; documentation and interpretation of archaeological evidence.

**ANTHR 531: Ethnographic Methods**

(Dual-listed with ANTHR 431). (3-0) Cr. 3.

Hands-on training in ethnographic field methods; students will carry out research projects in socio-cultural anthropology, learning a variety of investigative research techniques commonly used in social sciences.

**ANTHR 532: Current Issues in Native North America**

(Dual-listed with ANTHR 332). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 532A: Current Issues in Native North America: Gender and Family**

(Dual-listed with ANTHR 332A). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 532B: Current Issues in Native North America: Indigenous Ecologies and Geographies**

(Dual-listed with ANTHR 332B). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 532C: Current Issues in Native North America: Cultural and Political Movements**

(Dual-listed with ANTHR 332C). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 532D: Current Issues in Native North America: Regional Focus**

(Dual-listed with ANTHR 332D). (Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ANTHR 201 or ANTHR 306*

Exploration of key contemporary and historical issues in Native North America; discussion of current anthropological approaches to studying Native North America in a global context. Topics vary each time offered. ANTHR 322 or AM IN 210 recommended. Only 9 credits of ANTHR/AM IN 332A, 332B, 332C, 332D may count toward graduation.

**ANTHR 536: Culture and Capitalism**

(Dual-listed with ANTHR 336). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: ANTHR 201 or ANTHR 306*

Cross-cultural analysis of current development practices from an anthropological perspective; focus on international aid, development institutions, agrarian reform, indigenous knowledge, humanitarianism and human rights; introduction to main theories of political and economic anthropology.

Meets International Perspectives Requirement.

**ANTHR 540: Magic, Witchcraft, and Religion**

(Dual-listed with ANTHR 340). (Cross-listed with RELIG). (3-0) Cr. 3. S.

*Prereq: ANTHR 201 or ANTHR 306*

Survey of global religious belief and practice from an anthropological perspective. Emphasis on myth and ritual, shamanism, magic, witchcraft, beliefs in spirits, conceptions of the soul, mind and body relationships, and healing and therapeutic practices. Discussion of religious response to dramatic political and social change; effects of globalization on religious practice.

Meets International Perspectives Requirement.

**ANTHR 541: Seminar in Forensic Sciences**

(1-0) Cr. 1. Repeatable. S.

*Prereq: One 200-level science course or graduate classification*

Seminars by professional criminalists, research scientists, Certificate students, and educators. Emphasis on opportunities for research and development, citizen involvement, and educational outreach related to forensic science. Weekly report required.

**ANTHR 542: Independent Research and Presentation in Forensic Science**

(1-0) Cr. 1. S.

*Prereq: Enrollment in the Graduate Certificate in Forensic Sciences*

Research topic approved by course instructor. Written and oral reports required. Oral report given in forensics seminar, Chem 540.

**ANTHR 545: Biological Field School**

(Dual-listed with ANTHR 445). Cr. 4-6. SS.

*Prereq: ANTHR 202 or BIOL 101*

Summer field school for training in behavioral and ecological methods for primatologists. Proposal, data collection and analyses, and presentation of research topic in primatology.

**ANTHR 582: Topics in Biological Anthropology**

(Dual-listed with ANTHR 482). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 582A: Topics in Biological Anthropology: Paleoanthropology**

(Dual-listed with ANTHR 482A). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 582B: Topics in Biological Anthropology: Primate Cognition**

(Dual-listed with ANTHR 482B). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 582C: Topics in Biological Anthropology: Primate Conservation**

(Dual-listed with ANTHR 482C). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 582D: Topics in Biological Anthropology: Population Genetics and Human Evolution**

(Dual-listed with ANTHR 482D). (3-0) Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ANTHR 307*

In-depth study of current topics in biological anthropology, such as new fossil specimens, research on the evolution of cognition, the emergence of applied primatology, and the dynamic field of population genetics as each relates to the Order Primates.

**ANTHR 591: Orientation to Anthropology**

(1-0) Cr. 1. F.

*Prereq: Admission to the Anthropology Graduate Program*

Introduction to the Anthropology program, including the requirements for successful degree completion, department administrative procedures, ethics in anthropology and current trends in the four subfields of anthropology. Required of graduate students. Offered on a satisfactory-fail basis only.

**ANTHR 599: Creative Component**

Cr. 1-5. Repeatable, maximum of 5 credits. F.S.SS.

*Prereq: Graduate classification, permission of major professor*

Individually directed study applying anthropological methods and theory to a practical research problem; for students electing the nonthesis degree option.

**Courses for graduate students:****ANTHR 610: Foundations of Sustainable Agriculture**

(Cross-listed with A B E, AGRON, SOC, SUSAG). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**ANTHR 699: Research**

Cr. arr. Repeatable.

## Apparel, Events, and Hospitality Management (AESHM)

*Any experimental courses offered by AESHM can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**AESHM 111: Professional Development for AESHM**

(1-0) Cr. 1. F.S.

Introduction to professional experiences within AESHM and CHS Career Services including CyHire. Coursework includes resume development, daily habits for success including stress management, intrapersonal skills with a wellness focus, interpersonal skills and leadership, business etiquette, and professional ethics.

**AESHM 111L: AESHM Program Orientation and Learning Community**

(0-2) Cr. 1. F.S.

Orientation to policies and procedures of department and program. Overview of major and minor options, including entrepreneurship. Exploration of undergraduate research, independent studies, study abroad, and field studies. Coverage of goal setting, curriculum planning, degree audits, and registration. Peer mentor interaction in academic, extracurricular, and service learning arranged component.

**AESHM 170: Supervised Work Experience I**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor permission required; freshman classification or permission*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 170D: Supervised Work Experience I: Hospitality**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor Permission*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 170F: Supervised Work Experience I: Event Management**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor Permission*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 170N: Supervised Work Experience I: Apparel**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Advisor permission required; freshman classification*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. Offered on a satisfactory-fail basis only. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 175: Financial Applications for Retail and Hospitality Industries**

(2-0) Cr. 2. S.

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the apparel and hospitality industries.

**AESHM 175D: Financial Applications for Retail and Hospitality Industries: Hospitality Management**

(2-0) Cr. 2. S.

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the hospitality industries.

**AESHM 175N: Financial Applications for Retail and Hospitality Industries: Retail Merchandising**

(2-0) Cr. 2. S.

Using an online delivery method, students will learn basic mathematical concepts, calculations and formulas commonly used in the apparel and hospitality industries. Emphasis on problem solving, critical/creative thinking, and mathematical interpretation of calculations and formulas used within the apparel industries.

**AESHM 180: First Year Student Field Study**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to A M D, HSP M, or EVENT majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.



**AESHM 180E: First Year Student Field Study: Hospitality and Event Management**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to majors in the HSP M and EVENT majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.

**AESHM 180N: First Year Student Field Study: Apparel, Merchandising, and Design**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Instructor*

Study of and tours of regional areas of interest to A M D majors. Trip to regional location under supervision of faculty member. Locations vary. Journal entries and final report/analysis are required. Cost associated with trip.

**AESHM 211: Leadership Experiences and Development (LEAD)**

(3-0) Cr. 3. F.S.

Introduction to leadership behaviors. Development and utilization of leadership behaviors to positively impact school life, community life, and work life.

**AESHM 222: Creativity on Demand**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Learn to use creativity strategies to solve everyday problems related to personal and professional lives. Application of creative thinking techniques to view things from different perspectives; identify unique opportunities; and generate and evaluate original ideas.

**AESHM 238: Human Resource Management**

(3-0) Cr. 3. F.S.

*Prereq: A M D 275 or AESHM 270, or AESHM 287 or concurrent enrollment; sophomore classification*

Principles and practices of human resource management relevant to human science-related organizations. Emphasis on the entry-level manager's role.

**AESHM 270: Supervised Work Experience II**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 270D: Supervised Work Experience II: Hospitality**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification; 6 credits in AESHM or HSP M; Credits in AESHM 170*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, AESHM 270, and 470 may be applied toward graduation.

**AESHM 270F: Supervised Work Experience II: Event Management**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; 6 credits in AESHM, HSP M, or EVENT*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 270N: Supervised Work Experience II: Apparel**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Minimum 2.0 GPA; Advisor permission; Sophomore classification; AMD major*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits total from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 272: Fashion Show Production and Promotion**

(2-2) Cr. 2-3. Repeatable, maximum of 5 credits. F.S.

*Prereq: Application and instructor permission*

Planning and production of fashion show including developing budgets, public relations, advertising, fund-raising, choreography, staging, lighting, and food. Promotion of fashion show and similar events. Maximum of 5 credits can be applied to graduation

**AESHM 280: Orientation to U.S. Field Study**

Cr. R. Repeatable, maximum of 2 times. F.S.

Orientation to the field study location during the semester preceding the trip.

**AESHM 281: Orientation to International Field Study**

Cr. 1. Repeatable, maximum of 2 times. F.S.

Orientation to the field study location during the semester preceding the trip.



**AESHM 287: Principles of Management in Human Sciences**

(3-0) Cr. 3. F.S.

Introduction to management concepts and principles with application to human sciences-related businesses and organizations. Includes service quality management, professionalism, and social responsibility.

**AESHM 311: Seminar on Careers and Internships**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111. Sophomore classification. Good academic standing*

Orientation to AESHM internship policies, professional expectations and responsibilities. Coursework includes career planning including entrepreneurship, internship search strategies and resources, résumés and cover letters, professional branding, portfolios, networking, interview skills, leadership skills, and ethical dilemmas in the workplace.

**AESHM 311E: Seminar on Careers and Internships: Event Management and Hospitality Management**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111; Sophomore classification*

Internship and career planning, professional expectations and responsibilities. Résumé development, business letters/professional correspondence, interviewing techniques, and business etiquette.

**AESHM 311N: Seminar on Careers and Internships: Apparel, Merchandising, and Design**

(1-0) Cr. 1. F.S.

*Prereq: AESHM 111; Sophomore classification*

Internship and career planning, professional expectations and responsibilities. Résumé development, cover letters, interviewing techniques, and business etiquette.

**AESHM 340: Hospitality and Apparel Marketing Strategies**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101*

Application of marketing principles to the hospitality-, events-, and apparel-related industries. Emphasis on the role of marketing in an organization's overall strategic planning. Development and evaluation techniques available to hospitality, events, apparel, and related businesses, including advertising, sales promotion, packaging, and public relations.

**AESHM 342: Aesthetics of Consumer Experience**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Design principles, aesthetic concepts, and research applied to consumer experiences, with an emphasis on hospitality and retail environments and events. Influence of individual differences and cultural patterns on aesthetic preferences.

**AESHM 365: Event, Hospitality, and Retail Risk Management**

(3-0) Cr. 3. SS.

Overview and management of hazards and risks in the planning, design, operation, and evaluation stages of events, hospitality organizations, and apparel/retail environments.

**AESHM 380: U.S. Field Study**

(Dual-listed with AESHM 580). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380D: U.S. Field Study: Hospitality Management**

(Dual-listed with AESHM 580D). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in AESHM or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380F: U.S. Field Study: Event Management**

(Dual-listed with AESHM 580F). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in EVENT, AESHM, or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the majors in the Event Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 380N: U.S. Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 580N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 381: International Field Study**

(Dual-listed with AESHM 581). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department.

Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 381D: International Field Study: Hospitality Management**

(Dual-listed with AESHM 581D). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 381F: International Field Study: Event Management**

(Dual-listed with AESHM 581F). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Event Management major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 381N: International Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 581N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D and/or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of Advisor; Junior classification*

Required of all cooperative education students seeking full-time status.

Students register for this course prior to commencing each work period.

**AESHM 421: Developing Global Leadership: Maximizing Human Potential (3-0) Cr. 3. S.**

Development of leadership in a global environment. Focus on global concerns that impact on the well-being of individuals, families, and communities. Strategies for working with individuals, families and communities in other countries and cultures. Taking local action on global issues. Participation in a service activity.

Meets International Perspectives Requirement.

**AESHM 470: Supervised Professional Internship**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: AESHM 311 (all majors); EVENT 271 (Event Management majors); AESHM 211 (Hospitality Management majors)*

Supervised work experience with a cooperating firm or organization, documentation of experience, and completion of an internship project. Coursework includes weekly self-reflection and topics related to current issues and career advancement. Employer/experience should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, AESHM 270, and AESHM 470 may be applied toward graduation

**AESHM 470F: Supervised Professional Internship: Event Management**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: Permission by application; Junior classification*

Supervised and structured practical industry work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. This course is offered for a grade. Maximum number of credits given in a semester is 6. No more than 12 credits from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 470N: Supervised Professional Internship: Apparel**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: AESHM 311, 9 credits in A M D, and minimum 2.0 GPA; permission by application; junior or senior classification; employer/experience should be different than employer/experience for AESHM 170 and 270*

Supervised work experience with a cooperating firm or organization. Employer/experience for AESHM 470 or HSP M 470 should be different from employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, 270, and 470 may be applied toward graduation.

**AESHM 472: Fashion Show Management**

(2-2) Cr. 2-3. Repeatable, maximum of 5 credits. F.S.

*Prereq: Permission of Instructor*

Provide leadership and communicate direction for planning and production of fashion show, including developing budgets, publicity, advertising, fundraising, choreography, staging, lighting, and food.

Maximum of 5 credits can be applied to graduation

**AESHM 474: Entrepreneurship in Human Sciences**

(3-0) Cr. 3. F.S.

*Prereq: A M D 275 or AESHM 287 or ACCT 284 or 3 cr in MKT or permission of instructor*

Comprehensive approach to entrepreneurship including concepts of innovation, creativity, opportunity assessment, and business planning. Focus on human sciences-related businesses: retail, service, hospitality, event, food-related, family-owned, rural, and community businesses. Interaction with entrepreneurs, market research, feasibility analysis, business proposals, and business/community outreach and consulting.

**AESHM 490H: Independent Study: Honors**

Cr. 2-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor; Full membership in Honors Program*

**AESHM 497: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of Advisor; Senior or graduate classification*

Required of cooperative education students. Students must register for this course prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**AESHM 501: Introduction to Scholarly Research for Graduate Students**

Cr. 1. F.S.SS.

Focus on the basics of developing scholarly research, including definition and purpose of research and the components of research reporting. Emphasis on standards for each section of research reports. Tips for research reporting and processes of research development. An introduction to ethical standards. Required of all new AESHM graduate students. Offered on a satisfactory-fail basis only.

**AESHM 502: Research Methods in Apparel, Events, and Hospitality**

(3-0) Cr. 3. SS.

*Prereq: Enrolled in graduate program*

Overview of research methods for qualitative, quantitative, and mixed methods. Topics include philosophical worldviews, the use of theory, and different research approach, design, methodologies, and procedures.

**AESHM 510: Quantitative Research Methods in Apparel, Events, and Hospitality**

Cr. 3. Alt. S., offered odd-numbered years. Alt. SS., offered odd-numbered years.

*Prereq: STAT 587 or equivalent; Graduate standing in the Department; Permission of instructor*

Overview of quantitative research methods in apparel and hospitality fields. Topics include types of quantitative research design, sampling design, measurement, validity issues, power and precision analysis, methods of data gathering and analysis techniques, and interpretation of statistical results. Use of statistical packages. Development of research plan.

**AESHM 511: Seminar**

Cr. 1-3. Repeatable, maximum of 6 times.

*Prereq: 6 graduate credits in A M D, AESHM, or HSP M. Permission of instructor*

Discussion of scholarship and current issues. Topics vary.

**AESHM 512: Qualitative Research Methods in Apparel, Events, and Hospitality**

Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: Graduate status*

Introduction to and hands-on experiences with a variety of qualitative research methods specific to apparel, events and hospitality research. Students will develop skills at research design, data, collection, analysis, and write-up for qualitative inquiry.

**AESHM 570: Practicum**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 570A: Apparel Merchandising and Design**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 570B: Hospitality Management**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience related to career objective. Proposal must be approved semester before placement.

**AESHM 574: Entrepreneurship in Human Sciences**

(3-0) Cr. 3. F.S.

*Prereq: A M D 275 or AESHM 287 or ACCT 284 or 3 cr in MKT or permission of instructor*

Comprehensive approach to entrepreneurship including concepts of innovation, creativity, opportunity assessment, and business planning. Focus on human sciences-related businesses: retail, service, hospitality, event, food-related, family-owned, rural, and community businesses. Interaction with entrepreneurs, market research, feasibility analysis, business proposals, and business/community outreach and consulting.

**AESHM 579: Data Analytics for Apparel, Event, and Hospitality Management**

(3-0) Cr. 3. Alt. F., offered even-numbered years. Alt. SS., offered odd-numbered years.

*Prereq: STAT 587 or equivalent (AESHM 510, HD FS 503) or permission of instructor*

Business analytics is a process of transforming data into meaningful insights and actionable results in the context of decision making and problem solving. Review of the data-related challenges apparel, event, and hospitality organizations confront and the importance of data analytics in making critical management decisions. Basic analytic techniques including data management, analysis, interpretation, and visualization and analyze case studies that successfully deployed these techniques.

**AESHM 580: U.S. Field Study**

(Dual-listed with AESHM 380). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580D: U.S. Field Study: Hospitality Management**

(Dual-listed with AESHM 380D). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in AESHM or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580F: U.S. Field Study: Event Management**

(Dual-listed with AESHM 380F). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in EVENT, AESHM, or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the majors in the Event Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 580N: U.S. Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 380N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 280 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 280.

**AESHM 581: International Field Study**

(Dual-listed with AESHM 381). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in A M D, AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA. Permission by application*

Study and tours of areas of interest to majors in the AESHM Department. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 581D: International Field Study: Hospitality Management**

(Dual-listed with AESHM 381D). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Hospitality Management program. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281. Meets International Perspectives Requirement.

**AESHM 581F: International Field Study: Event Management**

(Dual-listed with AESHM 381F). Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in AESHM, EVENT, and/or HSP M; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Event Management major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**AESHM 581N: International Field Study: Apparel, Merchandising, and Design**

(Dual-listed with AESHM 381N). Cr. 1-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 9 credits in A M D and/or AESHM; sophomore classification; minimum 2.0 GPA; AESHM 281 or concurrent enrollment; permission by application*

Study and tours of areas of interest to majors in the Apparel, Merchandising, and Design major. Trip to location under supervision of faculty member. Locations and lengths of trip vary. Final projects, reports, journal entries, and analysis are required. May be combined with AESHM 281.

Meets International Perspectives Requirement.

**Courses for graduate students:**

**AESHM 611: Seminar**

Cr. 1-3. Repeatable.

*Prereq: 6 graduate credits in AESHM, A M D, or HSP M. Permission of instructor*

Scholarship and current issues. Topics vary.

**AESHM 670: Teaching Practicum**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670A: Teaching Practicum: Apparel Merchandising and Design**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670B: Teaching Practicum: Hospitality Management**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

Supervised experience in the university classroom. Proposal must be approved semester before placement.

**AESHM 670C: Teaching Practicum: Event Management**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 6 graduate credits in program area; permission of instructor*

This practicum is designed to provide event management graduate students (the graduate instructor) with experience in instructional planning, management, and systematic delivery of designed instruction for event undergraduate courses. Proposal must be approved semester before placement.

## Apparel, Merchandising and Design (A M D)

***Any experimental courses offered by A M D can be found at:***

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**A M D 121: Apparel Assembly Processes**

(2-4) Cr. 4. F.S.

Principles of garment and textile-related product assembly taught using industrial machines and production equipment. Construction techniques build in complexity in the development, assembly, and analysis of component parts and complete garments. Concurrent enrollment in A M D 204 recommended.

**A M D 131: Fashion Products and Markets**

(3-0) Cr. 3. F.

Fashion industry from concept to consumer. Focus on fashion-driven consumer goods. Development and prototyping of fashion products for a target market.

**A M D 165: Dress, Appearance, and Diversity in U.S. Society**

(3-0) Cr. 3. F.S.

Analyze foundational concepts and theories related to dress, identity, fashion, and culture and how they intersect with sex, gender, sexuality, beauty, attractiveness, disability, religion, race, and ethnicity with heightened attention to marginalized communities in the United States. Analyze the experiences and the role of fashion, clothing, dress, and/or accessories for identity development. Critique the social justice issues within the fashion system and identify the driving forces of transformative social justice change in the fashion system. Deconstruct one's personal values and positionalities in relation to fashion, clothing, dress, and/or accessories.

Meets U.S. Diversity Requirement



**A M D 178: Introduction to Apparel Design Studio**

(0-6) Cr. 3. F.S.

Introduction to the elements and principles of design in fashion and apparel including skill development in fashion illustration, technical drawing, and fabric rendering using traditional media. Application of written and verbal presentations to communicate fashion and apparel design concepts and terminology. Fashion presentation and introduction to portfolio development.

**A M D 204: Textile Science**

(3-2) Cr. 4. F.S.

*Prereq: A M D 131*

Textile fibers, yarns, fabrication, coloration, and finishes. Quality and performance application to textile products. Lab work included.

**A M D 206: Design Selective Advancement**

Cr. R. Repeatable, maximum of 2 times. F.S.

*Prereq: Completion or enrollment in A M D 121, A M D 131, A M D 165, A M D 178, and A M D 204 with subset 2.5 GPA, 2.0 cumulative GPA (including transfer work), and enrollment in major*

Project review and skill assessment related to 2-dimensional and 3-dimensional visualization, apparel assembly, basic product knowledge, design problem solving, illustration, textiles. Grade point averages are part of scoring process. Offered on a satisfactory-fail basis only.

**A M D 210: Computer Applications in Digital Design**

(2-2) Cr. 3. F.S.

*Prereq: A M D 245*

Applications of skills in Photoshop, Illustrator, InDesign, Google Sketch-up, Excel, and website development. Introduction to digital product design and line development. Focus on elements and principles of design. Introduction to digital portfolio development for design and merchandising. In-class demonstrations and online lectures.

**A M D 225: Patternmaking I: Drafting and Flat Pattern**

(1-4) Cr. 3. F.S.

*Prereq: A M D 121, A M D 204, A M D 206. Permission of instructor.*

Application of patternmaking tools and their functions, measurement techniques, pattern labeling, and patternmaking communication documents. Sloper drafting and flat pattern manipulation methods for women's apparel. Design and construction of original garments using drafted slopers and flat pattern manipulation methods to enable the analysis of fit.

**A M D 231: Product Development and Manufacturing**

(3-2) Cr. 4. F.S.

*Prereq: A M D 204*

Analysis of apparel product development, sourcing, and manufacturing processes. Focus on materials and specifications relative to quality, performance, cost, and price. Applications of software for PLM.

**A M D 245: Aesthetics and Brand Image**

(3-0) Cr. 3. F.S.

*Prereq: A M D 131; A M D 165; credit or concurrent enrollment in A M D 204*  
Elements and principles of design. Analysis of sensory, expressive, and symbolic aspects that build brand image, with a focus on fashion products and promotional settings.

**A M D 257: Museum Studies**

(3-0) Cr. 3. F.

*Prereq: Sophomore standing*

Overview of museums including history, functions, and philosophy. Collection and curatorial practices. Funding and governance issues. Hands-on object research and exhibit development. Required field trip.

**A M D 275: Retail Merchandising**

(3-0) Cr. 3. F.S.

*Prereq: 3 credits in Math*

Principles of merchandising as applied to retail-, service-, events-, and hospitality-related businesses. Study of the planning, development, and presentation of apparel- and hospitality-related products, services, and experiences. Industry and market research, planning of new offerings, and development of promotional and competitive strategies for various retail formats.

**A M D 278: Fashion Illustration**

(0-6) Cr. 3. F.S.

*Prereq: A M D 178, A M D 210 or concurrent enrollment, A M D 245 or concurrent enrollment. Permission of instructor.*

Development of fashion plates and focused apparel lines/collections. Proficiency in drawing the fashion figure, technical drawings/flats, and apparel using a variety of media. Continuation of fashion presentation and portfolio development.

**A M D 288: Styling**

(3-0) Cr. 3. F.S.

*Prereq: A M D 131; A M D 275*

Focus on the many facets of the styling profession, including commercial styling, editorial (magazine) styling, personal style consultation, and red-carpet styling. Study of the practical requirements of the profession and the importance of an appropriate digital presence. Course will utilize a hands-on approach with lectures and projects.

**A M D 290: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshmen or Sophomore Classification; Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. Total number of A M D 290 and A M D 490 credits applied to graduation cannot exceed 9 credits.



**A M D 290R: Independent Study: Professional Practice**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshmen or Sophomore Classification; Permission of instructor, advisor, and department chair.*

Experiences in teaching assistantship for first-year and second-year students. Total number of A M D 290 and A M D 490 credits applied to graduation cannot exceed 9 credits.

**A M D 305: Quality Assurance of Textiles and Apparel**

(Dual-listed with A M D 505). (2-2) Cr. 3. F.

*Prereq: A M D 204, A M D 231, one course in natural science; STAT 101, or STAT 226, or STAT 587*

Principles of product and materials evaluation and quality assurance. Developing specifications and using standard practices for evaluating materials, product characteristics, performance, and quality.

**A M D 310: Computer Aided Apparel Patternmaking**

(0-6) Cr. 3. F.S.

*Prereq: A M D 210, A M D 225; Permission of instructor.*

Introduction to the computer-aided patternmaking software related to pattern modification, pattern drafting, grading, marker making, and 3-D virtual fitting.

**A M D 321: Computer Integrated Textile and Fashion Design**

(0-6) Cr. 3. F.S.

*Prereq: A M D 210, A M D 278 or concurrent enrollment. Permission of instructor*

Analysis and advanced use of computer-aided design software for soft-good fabrication design for various target markets. Development of digital presentation for portfolio integration.

**A M D 325: Patternmaking II: Draping**

(0-6) Cr. 3. F.S.

*Prereq: A M D 206, A M D 225; permission of instructor.*

Principles of patternmaking through basic draping techniques. Application of draping techniques to sportswear and formal wear garments. Analysis of fit and design; problem solving and interaction of fabric characteristics with style features.

**A M D 328: Apparel, Merchandising, and Design Seminar**

Cr. 1-3. Repeatable. F.S.SS.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.

**A M D 328T: Apparel, Merchandising, and Design Seminar: Fashion Trend Forecasting**

Cr. 1-3. F.S.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.

**A M D 328Y: Apparel, Merchandising, and Design Seminar: Styling**

Cr. 1-3.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term. Maximum of 6 credits can be applied toward graduation.

**A M D 329: Digital Textile Printing for Apparel Design**

(2-2) Cr. 3. F.S.

*Prereq: A M D 321; A M D 325 or concurrent. Permission of instructor*

Overview of the use of digital printing in the textile and apparel industry, color matching, repeat print patterns, engineered prints, and creation of apparel prototypes.

**A M D 354: Euro-American Dress History: Prehistoric to Mid-19th Century**

(3-0) Cr. 3. F.

Survey of history of dress from ancient times up to the American Civil War; focus on European and North American dress. Emphasis on connection of dress to the social, cultural, environmental, and technological contexts of the Western world.

Meets International Perspectives Requirement.

**A M D 356: Euro-American Dress History: Mid-19th Century to the Present**

(3-0) Cr. 3. S.

Survey of major design and technological developments from the 1870s through the present. Emphasis on fashion as a system of design and production, culture of consumption, fashion change, and trends in art, society, and culture. A M D 204 recommended.

**A M D 362: Cultural Perspectives of Global Dress**

(3-0) Cr. 3. S.

Analysis of multiple factors related to dress in selected societies, including technology, cultural identity, aesthetics, social organization, ritual, stability and change. Applications to fair trade and social responsibility.

Meets International Perspectives Requirement.

**A M D 372: Sourcing and Global Issues**

(3-0) Cr. 3. F.S.

*Prereq: A M D 231; A M D 275*

Evaluation of key issues facing textile and apparel industries in global markets considering ethical, economic, political, social, and professional implications. Sourcing strategies in a global environment. Corporate and consumer social responsibility and sustainability. ECON 101 or ECON 102 recommended.

Meets International Perspectives Requirement.

**A M D 375: Omni-Channel Retailing**

(3-0) Cr. 3. S.

*Prereq: 3 credits in marketing or A M D 275 or AESHM 287*

A customer-centric view of marketing with a focus on the retailer-customer relationship and omni-channel strategies. Analysis and evaluation of integrated retail applications and strategies using digital media, including store formats, e-commerce, catalog, mobile, crowdsourcing, and social media.

**A M D 376: Merchandise Planning and Buying**

(3-2) Cr. 4. F.S.

*Prereq: A M D 275; COM S 113; 3 credits from ACCT 284, MATH 104, MATH 105, MATH 140, MATH 150, or equivalent.*

Calculations and computer application in the planning and control of merchandise. Emphasis on retail math as it pertains to assortment planning, the six-month buying plan process, and other buying concepts and strategies. Online modules.

**A M D 377: Visual Presentation and Promotions**

(3-0) Cr. 3. F.S.

*Prereq: A M D 210; (A M D 245 or AESHM 342); (MKT 340 or AESHM 340)*

Principles of visual aspects of brand development and management; emphasis on branding, visual merchandising, design/layout of retail spaces. Includes applications such as visual communication and documentation using Adobe Creative Suite(R), hands-on display projects, and brand case studies.

**A M D 388: Trend Forecasting**

(3-0) Cr. 3. F.S.

*Prereq: A M D 204, A M D 245, A M D, 275, 3 credits from ACCT 284, MATH 104, MATH 105, MATH 140, MATH 150, or equivalent*

Explore many facets of fashion forecasting, including trend research, managing inspiration sources and trend ideas, product adoption, degrees of difference, and turning a fashion forecast into a buying plan. Applications of fashion forecasting will be examined, who does it and how it fits into various careers. The course will utilize a hands-on approach with lecture, discussion, and projects.

**A M D 393: Apparel, Merchandising, and Design Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: A M D Junior or Senior Classification and Permission of Instructor.*

Intensive 2- to 8-week workshop exploration. Topics vary each time offered. Maximum of 6 credits applied to graduation.

**A M D 404: Innovative Textiles**

(Dual-listed with A M D 504). (2-2) Cr. 3. S.

*Prereq: A M D 204, CHEM 163 and CHEM 163L or equivalent*

Theories and principles of textile science. Textile product serviceability.

Effect of fiber structure on properties and performance. New developments in textiles.

**A M D 415: Technical Design Processes**

(2-2) Cr. 3. F.

*Prereq: A M D 225; A M D 231*

Garment development and analysis of fit, performance, quality, cost.

Exploration of alternative materials, construction methods, grading; specifications and portfolio development.

**A M D 426: Creative Design Processes**

(1-4) Cr. 3. S.

*Prereq: A M D 206, A M D 321, A M D 325 or concurrent*

Exploration of the creative apparel design process and sources of inspiration with emphasis on activist design, wearable art; experimentation of advanced design problem solving, alternative materials, fabric manipulation, and pattern-making techniques.

**A M D 431: Apparel Production Management**

(2-2) Cr. 3. S.

*Prereq: A M D 231; A M D 372*

Procedures and experiences related to application and use of process controls: method analysis, work measurement, costing, pricing, and production planning. Resource management, technology applications, and quality assurance. A M D 121 recommended.

**A M D 458: Queer Fashions: History, Culture, and the Industry**

(Dual-listed with A M D 558). (Cross-listed with WGS, WGS). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and unequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**A M D 467: Consumer Studies in Apparel and Fashion Products**

(3-0) Cr. 3. F.

*Prereq: A M D 165; (AESHM 340 or MKT 340); (STAT 101 or STAT 104 or STAT 226)*

Application of concepts and theories from the social sciences to the study of consumer behavior related to dress, textile and apparel products, and retail experiences. Experience in conducting consumer research.

**A M D 475: Retail Analytics**

(2-2) Cr. 3. F.S.

*Prereq: A M D 376*

Evaluation of information needed to make effective retail decisions. Use of technology in analyzing and interpreting retail systems data. Application of concepts related to forecasting, consumer demand, assortment planning, market research, data mining, database interface, pattern recognition, supply-chain/logistics management, retail technology applications.

**A M D 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

Independent Study. Maximum of 9 credits of both A M D 290 and A M D 490 can be applied toward graduation.

**A M D 490A: Independent Study: Textile Science**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490B: Independent Study: Historical, Cultural, and Museum Studies of Dress and Textiles**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490C: Independent Study: Textile and Apparel Design**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490E: Independent Study: Merchandising, Aesthetics, and Entrepreneurship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490F: Independent Study: Sociological, Psychological, and Consumer Behavioral Aspects of Dress**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490H: Independent Study: Honors**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490J: Independent Study: Product Development, Innovation, and Sourcing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490R: Independent Study: Professional Practice**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair.*

**A M D 490S: Independent Study: Production and Quality Assurance**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 490W: Independent Study: Fashion Show, Fashion Public Relations and Marketing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Prereq: 6 credits in A M D. Permission of the instructor, advisor, and department chair*

**A M D 495: Senior Design Studio**

(Dual-listed with A M D 595). (0-6) Cr. 3. F.

*Prereq: A M D 310, A M D 325 and A M D 329. Permission of instructor.*

Creation of an apparel line from target market research to prototypes through the use of manual techniques and CAD technologies. The line is to be included in a professional portfolio and pieces submitted to a juried exhibition.

**A M D 496: Soft-Goods Product Development and Prototyping**

(3-0) Cr. 3. S.

*Prereq: A M D 231, A M D 245, A M D 275, A M D 321*

Capstone soft-good innovative product development course focusing on product development through design thinking and practice. Applying consumer, aesthetic, and quantitative trend information to develop value-added soft-good products and product lines for diverse target markets. Integrated course with industry partner(s) with development of a prototype and presentation for portfolio integration.

**A M D 499: Undergraduate Research**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Senior classification, 15 credits in A M D. Permission of instructor, advisor, and department chair*

Research experience in textiles and clothing with application to a selected problem.

**Courses primarily for graduate students, open to qualified undergraduates:**

**A M D 504: Innovative Textiles**

(Dual-listed with A M D 404). (2-2) Cr. 3. S.

*Prereq: A M D 204, CHEM 163 and CHEM 163L or equivalent*

Theories and principles of textile science. Textile product serviceability. Effect of fiber structure on properties and performance. New developments in textiles.

**A M D 505: Quality Assurance of Textiles and Apparel**

(Dual-listed with A M D 305). (2-2) Cr. 3. F.

*Prereq: A M D 204, A M D 231, one course in natural science; STAT 101, or STAT 226, or STAT 587*

Principles of product and materials evaluation and quality assurance. Developing specifications and using standard practices for evaluating materials, product characteristics, performance, and quality.

**A M D 510: Foundation of Scholarship in Apparel, Merchandising, and Design**

(3-0) Cr. 3. F.

*Prereq: Graduate classification or permission of instructor*

Overview of scholarship in apparel, merchandising, and design with emphasis on current and future directions. Fundamentals of writing literature reviews. Examination of ethical issues in scholarship and academic life. Introduction to creativity, sustainability, and entrepreneurship.

**A M D 521: Digital Technologies in Textile and Apparel**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Research Methods course. Permission of instructor.*

Digital technologies in textile and apparel design. Theories and practices connected to technology in apparel fields. Technologies explored in this class may include digital textile design and printing, 3D body scanning, avatar development for digital fitting or other advanced technologies used in the textile and apparel industries.

**A M D 525: Experimental Patternmaking**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AMD 121 or equivalent, AMD 225 or equivalent, AMD 510 or taking concurrently, permission of instructor*

Research, analyze, and apply experimental patternmaking techniques to original garments suitable for entry into a juried competition/exhibitions. Compare, contrast, and organize a framework of research patternmaking principles through content analysis or other appropriate research techniques. Documentation of learning and design process.

**A M D 539: Digital Textile Design and Theory**

Cr. 3. Repeatable. Alt. S., offered even-numbered years.

Focus on artisanal textile, apparel, or surface and structural design techniques. Design processes for specialty fabrics and markets. Topics vary by term.

**A M D 545: Consumer Experience and Retail Branding**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: One course in design elements and principles, psychology, consumer behavior, or marketing*

Examination of hedonic nature of consumer experience and its application to experiential design and branding of retail/hospitality establishments. Emphasis on consumer behavior, environmental psychology, and marketing literature.

**A M D 554: Dress History Research Methods**

Cr. 3. Alt. S., offered odd-numbered years.

Using a variety of sources and methods of analysis, students will develop their ability to read and interpret primary and secondary sources and to understand the methodology underpinnings and process of constructing dress history.

**A M D 558: Queer Fashions: History, Culture, and the Industry**

(Dual-listed with A M D 458). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and inequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**A M D 565: Sustainability: Theory and Practical Application**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 3 credits in research methods; basic knowledge of apparel industry and product development; permission of instructor.*

Overview of current sustainability theory, research, and methodology. Emphasis on the evaluation and discussion of current sustainability literature and sustainable practice of apparel, textiles, and related products and services through people, processes, and the environment. Development and presentation of original scholarly and creative design work under various sustainability frameworks.

**A M D 567: Consumer Behavior and Apparel**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A M D 467 or MKT 447; STAT 401*

Application of concepts and theories from the social sciences to the study of consumer behavior. Experience in conducting research; manuscript writing.

**A M D 572: Sourcing and Global Issues**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A course in merchandising, marketing, or economics*

Evaluation of textile and apparel industries in global markets considering ethical, economic, political, social, and professional implications. Sourcing strategies in a global environment. Corporate and consumer social responsibility and sustainability. Experience in conducting research using secondary data.

Meets International Perspectives Requirement.

**A M D 576: Industry Applications in Merchandising and Management**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: A M D 376 or equivalent; A M D 275 or equivalent; or permission of instructor*

Using the case study method, students apply merchandising theory, principles, and practices to industry scenarios. Emphasis on problem solving, creative thinking, data analysis, and data interpretation involved in business operations. Focus on the development of leadership skills while functioning in small and large groups.

**A M D 577: E-Commerce for Apparel and Hospitality Companies**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Course in marketing or permission of instructor*

Analysis of technology and consumer trends, industry practices, and marketing strategies for e-commerce including big data, data mining, and social media. Evaluation and development of apparel or hospitality company websites. Theory application to the development of multi-channel business strategies.

**A M D 578: Social Network Analysis**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: STAT 587 or equivalent*

Introduction to social network related theories, practices and analyses. Visualize and analyze social structures, formed from social relationships, interactions, communications, and social media activities. Explore methods for social network data collection and data management, including application on big data. Practical guidelines on conducting SNA research in social science contexts, including applying SNA with big data.

**A M D 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590A: Special Topics: Textile Science**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590B: Special Topics: Historical, Cultural, and Museum Studies of Dress and Textiles**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590C: Special Topics: Textile and Apparel Design**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590E: Special Topics: Merchandising, Aesthetics, and Entrepreneurship**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590F: Special Topics: Sociological, Psychological, and Consumer Behavioral Aspects of Dress**

Cr. arr. Repeatable.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590J: Special Topics: Product Development, Innovation, and Sourcing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590S: Special Topics: Production and Quality Assurance**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 590W: Special Topics: Fashion Show, Fashion Public Relations and Marketing**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of director of graduate education, advisor, and instructor(s)*

Individually designed A M D-related projects that reflect the special interests of the student.

**A M D 595: Senior Design Studio**

(Dual-listed with A M D 495). (0-6) Cr. 3. F.

*Prereq: A M D 310, A M D 325 and A M D 329. Permission of instructor.*

Creation of an apparel line from target market research to prototypes through the use of manual techniques and CAD technologies. The line is to be included in a professional portfolio and pieces submitted to a juried exhibition.

**A M D 599: Creative Component**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in A M D*

**Courses for graduate students:****A M D 611: Seminar**

Cr. 1-3. Repeatable.

*Prereq: 6 graduate credits in A M D. Permission of instructor*

Discussion of scholarship and current issues. Topics vary.

**A M D 625: Design Theory and Process**

(2-4) Cr. 4. Alt. S., offered even-numbered years. Alt. SS., offered even-numbered years.

*Prereq: Permission of instructor.*

Analysis and application of design theory and creative processes, including strategies for solving aesthetic, functional, and/or technology-focused design problems. Creation and dissemination of design scholarship.

**A M D 665: Cultural and Social Science Theories in Fashion Studies**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Analysis of cultural and social science theories, concepts, frameworks, and epistemologies applicable to fashion, style, and dress research. Emphasis on qualitative research, theoretical interpretation, and theory development. Example theories examined include Black feminist theories, critical race theory, feminist queer crip, tribalcrit, symbolic interaction, and semiotics. Collection, analysis, and interpretation of qualitative data.

**A M D 676: Merchandising Theory and Research Applications**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: A M D 275 or equivalent; statistics course recommended.*

Review of current merchandising theory, research, and methodology. Emphasis on the evaluation and discussion of current and seminal merchandising literature, understanding research processes, interpretation of findings, assessing implications of research for future directions in merchandising, and the development and presentation of original scholarly work.



**A M D 690: Advanced Topics**

Cr. arr. Repeatable.

*Prereq: Enrollment in doctoral program, permission of instructor; and approval of D.O.G.E***A M D 699: Research**

Cr. arr. Repeatable.

## Arabic (ARABC)

***Any experimental courses offered by ARABC can be found at:***[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)**Courses primarily for undergraduates:****ARABC 101: Elementary Arabic I**

(4-0) Cr. 4. F.

Beginning level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture. Attention to the use of the Arabic alphabet.

**ARABC 102: Elementary Arabic II**

(4-0) Cr. 4. S.

*Prereq: ARABC 101 or placement by department exam*

Continuation of ARABC 101. Beginning level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 195: Study Abroad**

Cr. arr. Alt. SS., offered irregularly.

Supervised instruction in Arabic language and culture, formal class instruction at level appropriate to student's training, augmented by practical living experience. Taught in Arabic.

**ARABC 201: Intermediate Arabic I**

(4-0) Cr. 4. F.

*Prereq: ARABC 102 or placement by department exam*

Intermediate level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 202: Intermediate Arabic II**

(4-0) Cr. 4.

*Prereq: ARABC 201 or placement by department exam*

Continuation of Arabic 201. Intermediate level development of reading, writing, listening comprehension, and speaking in Arabic, within the context of Arabic culture.

Meets International Perspectives Requirement.

**ARABC 295: Study Abroad**

Cr. arr. Alt. SS., offered irregularly.

*Prereq: ARABC 102*

Supervised instruction in Arabic language and culture, formal class instruction at level appropriate to student's training, augmented by practical living experience. Taught in Arabic.

**ARABC 375: Arab Culture**

Cr. 3. S.

Survey of contemporary Arab culture in the Middle East and North Africa as reflected in history, language, the arts, and social institutions with attention to the Arab Diaspora. Taught in English.

Meets International Perspectives Requirement.

**ARABC 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Independent study with focus on areas other than those in which courses are offered. No more than 6 credits in ARABC 490 may be counted toward graduation.

## Architecture (ARCH)

***Any experimental courses offered by ARCH can be found at:***[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)**Courses primarily for undergraduates:****ARCH 201: Architectural Design I**

(1-15) Cr. 6. F.

*Prereq: Completion of the pre-professional program and admission into the professional program in Architecture.*

Introduction to architectural design including design process, drawing conventions, methods of design analysis, and model making using both analog and digital tools. Studio projects focus on formal and volumetric principles of pattern and composition, investigations of site conditions, and understanding of scale. Field trips to relevant architectural sites.

**ARCH 201H: Architectural Design I, Honors**

(1-15) Cr. 6-7. F.

*Prereq: Completion of the pre-professional program and admission into the professional program in Architecture*

Introduction to architectural design including design process, drawing conventions, methods of design analysis, and model making using both analog and digital tools. Studio projects focus on formal and volumetric principles of pattern and composition, investigations of site conditions, and understanding of scale. Field trips to relevant architectural sites.

**ARCH 202: Architectural Design II**

(1-15) Cr. 6. S.

*Prereq: ARCH 201; MATH 145; PHYS 131 and 131L*

Continuation of fundamental architectural design exploration. Studio projects focus on the generation of ideas based on experience and systematic analysis of tectonics. Emphasis on design development through detail, materiality, and spatial relationships. Students work in groups and individually. Representational methods expand on architectural conventions through experimentation. Field trips to relevant architectural sites.

**ARCH 202H: Architectural Design II, Honors**

(1-15) Cr. 6-7. S.

*Prereq: ARCH 201, MATH 145; and PHYS 131 and PHYS 131L*

Continuation of fundamental architectural design exploration. Studio projects focus on the generation of ideas based on experience and systematic analysis of tectonics. Emphasis on design development through detail, materiality, and spatial relationships. Students work in groups and individually. Representational methods expand on architectural conventions through experimentation. Field trips to relevant architectural sites.

**ARCH 220: Contemporary Architecture**

(3-0) Cr. 3. F.

Survey of global architectural ideas and practices from 1990 to the present. Emphasis will be given to recent movements and architectural manifestations, as well as close examinations of socio-cultural conditions for contemporary practice.

**ARCH 221: Histories and Theories of Architecture to 1750**

(3-0) Cr. 3. F.

Survey of architectural ideas, theories, and practices before 1750. Emphasis on the mutually formative relationship between architecture and the social, cultural, economic, and political forces, nationally and globally, in which it is produced.  
Meets International Perspectives Requirement.

**ARCH 230: Design Communications I**

(2-2) Cr. 3. F.

*Prereq: Admission to the Professional Program in Architecture*

Investigations of various design media and their applications to design. Exercises to develop representational skills and perceptual sensitivity.

**ARCH 231: Advanced Design Representation**

Cr. 3. Alt. F., offered irregularly.S.

*Prereq: ARCH 230; Junior, Senior or Graduate standing*

Advanced investigations of various design media and their applications to design. Emphasis on careful consideration of media, mixed-media strategies and development of craft.

**ARCH 301: Architectural Design III**

(1-15) Cr. 6. F.

*Prereq: ARCH 202*

Consideration of landscape as a constructed, cultural artifact. Projects address the perceptual aspects and strategies of situation and location; examination of environmental phenomena and patterns of use and settlement as revealed and affected by the architectural artifact. Development of a critical design process is stressed.

**ARCH 301H: Architectural Design III, Honors**

(1-15) Cr. 6-7. F.

*Prereq: ARCH 202*

Consideration of landscape as a constructed, cultural artifact. Projects address the perceptual aspects and strategies of situation and location; examination of environmental phenomena and patterns of use and settlement as revealed and affected by the architectural artifact. Development of a critical design process is stressed.

**ARCH 302: Architectural Design IV**

(1-15) Cr. 6. S.

*Prereq: ARCH 301 and minimum 2.0 GPA in previous studio courses*

Design for housing in an urban context that demonstrates a synthetic understanding of diverse scales of use and occupation as shaped by user requirements, site conditions, and principles for inclusive design. Consideration of regulatory requirements and measurable environmental impacts of the proposal on its site.

**ARCH 302H: Architectural Design IV, Honors**

(1-15) Cr. 6-7. S.

*Prereq: ARCH 301 and minimum 2.0 GPA in previous studio courses*

Design for housing in an urban context that demonstrates a synthetic understanding of diverse scales of use and occupation as shaped by user requirements, site conditions, and principles for inclusive design. Consideration of regulatory requirements and measurable environmental impacts of the proposal on its site.

**ARCH 321: History of the American City**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Study of the development of the built environment and urban condition in the United States from the colonial period to today. Primary attention is given to urban spatial organization, built form, technological change, regulatory and funding patterns, and social categories such as class, race, and gender. Credit counts toward fulfillment of History, Theory, Culture requirements.

Meets U.S. Diversity Requirement

**ARCH 322: Histories and Theories of Architecture after 1750**

(3-0) Cr. 3. S.

*Prereq: Sophomore classification*

Survey of architectural ideas, theories and practices from 1750 to 1990.

Emphasis on the mutually formative relationship between architecture and the social, cultural, economic, and political forces, nationally and globally, in which it is produced.

Meets International Perspectives Requirement.

**ARCH 334: Computer-aided Architectural Design**

(2-2) Cr. 3.

Exploration of current and potential applications of computing in architectural design. Projects engage digital design methods, data and media workflows.

**ARCH 335: Three-Dimensional Studio**

(1-4) Cr. 3. Repeatable, maximum of 6 credits.

This course deals with three dimensional problems in visual invention, organization, and expression emphasizing creative manipulation of tools, materials, and techniques as means for three-dimensional thinking. Projects cover the additive (modeling), subtractive (carving), substitutional (casting) as well as constructive techniques.

**ARCH 345: Building Science and Technology I**

(2-0) Cr. 2. F.

*Prereq: Admission to the professional program in architecture; concurrent enrollment in ARCH 345L*

First course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental forces and systems (solar orientation, climate, daylighting, natural ventilation, human comfort and occupancy patterns), materials and assemblies (drawing conventions, building codes, and physical properties of materials) and fundamental structural principles (forces/loads, equilibrium, and stability) to understand impact of the built environment on human health, safety, and welfare at building scales.

**ARCH 345L: Building Science and Technology I Lab**

(0-2) Cr. 1. F.

*Prereq: Admission to the professional program in architecture; concurrent enrollment in ARCH 345.*

Laboratory to accompany Arch 345 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.

**ARCH 346: Building Science and Technology II**

(3-0) Cr. 3. S.

*Prereq: ARCH 345, ARCH 345L, MATH 145, and PHYS 131 and PHYS 131L; concurrent enrollment in ARCH 346L.*

Second course in a sequence focused on architectural building technologies. Lectures and labs cover: environmental systems (heat transfer in the building envelope, passive heating and cooling, daylighting, thermal comfort, analytical guidelines and building energy calculation methods), materials & assemblies (building envelope systems, accessibility, egress, and material properties), and structural systems (structural system selection/comparison, and design and analysis of "form-active" compression and tension structures) to understand impact of the built environment on human health, safety, and welfare at building scales.

**ARCH 346L: Building Science and Technology II Lab**

(0-4) Cr. 2. S.

*Prereq: ARCH 345, ARCH 345L, MATH 145 and PHYS 131 and 131L; concurrent enrollment in ARCH 346.*

Laboratory to accompany Arch 346 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.

**ARCH 347: Building Science and Technology III**

(3-0) Cr. 3. F.

*Prereq: ARCH 346, ARCH 346L; concurrent enrollment in ARCH 347L. .*

Third course in a sequence focused on architectural building technologies. Lectures and labs cover: multistory building framing, assembly, and enclosure systems, sizing and selecting structural framing components (foundations, columns, beams, etc.), and an environmental design process that demonstrates the ability to integrate climate into the control of thermal, luminous, ventilative and acoustic environments. Introduction to plumbing and rain water collection systems to understand the impact of the built environment on human health, safety, and welfare at building scales and to assess those technologies against performance objectives of projects.

**ARCH 347L: Building Science and Technology III Lab**

(0-4) Cr. 2.

*Prereq: ARCH 346, ARCH 346L; concurrent enrollment in ARCH 347.*

Laboratory to accompany Arch 347 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.

**ARCH 348: Building Science and Technology IV**

(3-0) Cr. 3. S.

*Prereq: ARCH 347, ARCH 347L; concurrent enrollment in ARCH 348L.*

Fourth course in a sequence focused on architectural building technologies. Lectures and labs cover: ability to demonstrate active environmental HVAC control systems design, use and design of mechanical, electrical, plumbing, fire safety, transportation, and conveying systems and subsystems, constructed building assemblies and details (building envelope details for waterproofing and enclosure, advanced material properties, costs, and serviceability), and structural design for multi-story structures (design and documenting various framing patterns, integration with other building systems, and lateral stability strategies for wind and seismic) to understand the impact of the built environment on human health, safety, and welfare at building scales and to assess those technologies against performance objectives of projects.

**ARCH 348L: Building Science and Technology IV Lab**

(0-4) Cr. 2. S.

*Prereq: ARCH 347, ARCH 347L; concurrent enrollment in ARCH 348.*

Laboratory to accompany Arch 348 and must be taken concurrently. Integrating building technologies into architectural designs through experiments and exercises in laboratory format.

**ARCH 371: Human Behavior and Environmental Theory**

(3-0) Cr. 3.

Exploration of theories that describe social structure and order and the manner in which individuals and societies organize themselves and structure their environment.

**ARCH 401: Architectural Design V**

(1-15) Cr. 6. F.

*Prereq: ARCH 302*

Projects showing students' ability to integrate knowledge of sound building design into a comprehensive architectural proposal that reflects sustainable design principles. Consideration of site, structure, building envelope, environmental controls, life safety, and methods to measure building performance. Projects typically are closely connected to the physical, environmental, and social context of their sites.

**ARCH 401H: Architectural Design V, Honors**

(1-15) Cr. 6-7. F.

*Prereq: ARCH 302*

Projects showing students' ability to integrate knowledge of sound building design into a comprehensive architectural proposal that reflects sustainable design principles. Consideration of site, structure, building envelope, environmental controls, life safety, and methods to measure building performance. Projects typically are closely connected to the physical, environmental, and social context of their sites.

**ARCH 402: Architectural Design VI**

(1-15) Cr. 6. S.

*Prereq: Minimum grade of C in ARCH 401.*

An examination of the relationship between architecture and the city. Studio projects stress analysis and interpretation of the diverse forces and conditions that impact and inform architecture in the urban environment. Urban design project. Study abroad option.

**ARCH 402H: Architectural Design VI, Honors**

(1-15) Cr. 6-7. S.

*Prereq: Minimum grade of C in ARCH 401.*

An examination of the relationship between architecture and the city. Studio projects stress analysis and interpretation of the diverse forces and conditions that impact and inform architecture in the urban environment. Urban design project. Study abroad option.

**ARCH 403: Architectural Design VII**

(1-15) Cr. 6. F.

*Prereq: ARCH 402*

Advanced studio as incubator for examining progressive agendas within or beyond the discipline of architecture. Innovative research that is academically rigorous, critically informed, speculative, and design-led is encouraged. Projects and creative outputs vary per studio instructor.

**ARCH 403H: Architectural Design VII, Honors**

(1-15) Cr. 6-7. F.

*Prereq: ARCH 402*

Advanced studio as incubator for examining progressive agendas within or beyond the discipline of architecture. Innovative research that is academically rigorous, critically informed, speculative, and design-led is encouraged. Projects and creative outputs vary per studio instructor.

**ARCH 404: Architectural Design VIII**

(1-15) Cr. 6. S.

*Prereq: ARCH 403*

Advanced forum for architectural research and/or design. Choice of thematic studios or student initiated research and design. Experimentation and innovation are encouraged. DSN S 446 or DSN S 546, for 6 cr. each time taken, can be substituted for this class and be taken up to a maximum of 12 credits.

**ARCH 404H: Architectural Design VIII, Honors**

(1-15) Cr. 6-7. S.

*Prereq: ARCH 403*

Advanced forum for architectural research and/or design. Choice of thematic studios or student initiated research and design. Experimentation and innovation are encouraged. DSN S 446 or DSN S 546, for 6 cr. each time taken, can be substituted for this class and be taken up to a maximum of 12 credits.

**ARCH 417: Big and Tall: A History of Construction**

(Dual-listed with ARCH 517). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* ARCH 417: Junior or Senior Classification, ARCH 517: Graduate classification

History, theory, and principles of construction from ancient times through today. Analytic project or term paper and weekly readings with discussion questions. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 420: Topics in American Architecture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of American architecture and urban design considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment of History, Theory, Culture requirements. A maximum of 6 credits of ARCH 420 may be applied to degree program.

**ARCH 422: Topics in Medieval Architecture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of medieval architecture and urban design considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment of History, Theory, Culture requirements. A maximum of 6 credits of ARCH 422 may be applied to degree program.

Meets International Perspectives Requirement.

**ARCH 423: Topics in Renaissance to Mid-Eighteenth Century Architecture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of renaissance to mid-eighteenth century architecture and urban design considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment of History, Theory, Culture requirements. A maximum of 6 credits of ARCH 423 may be applied to degree program.

Meets International Perspectives Requirement.

**ARCH 424: Topics in Nineteenth Century Architecture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of nineteenth century architecture and urban design considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment History, Theory, Culture requirements. A maximum of 6 credits of ARCH 424 may be applied to degree program.

**ARCH 425: Topics in Twentieth Century and Contemporary Architecture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of twentieth century architecture and urban design considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment History, Theory, Culture requirements. A maximum of 6 credits of ARCH 425 may be applied to degree program.

**ARCH 426: Topics in Native American Architecture**

(Cross-listed with AM IN). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

History, theory, and principles of Native American/American Indian architecture, landscape architecture and planning considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment History, Theory, Culture. A maximum of 6 credits of ARCH 426 may be applied to degree program.

**ARCH 427: History, Theory, and Criticism of Chinese Architecture**

(Dual-listed with ARCH 527). (3-0) Cr. 3. F.

*Prereq:* ARCH 427: Senior classification, ARCH 527: Graduate classification

The history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relationship to art, landscape design, and urban structure. Credit counts toward fulfillment History, Theory, Culture.

Meets International Perspectives Requirement.

**ARCH 429: Topics in Italian Architecture**

(3-0) Cr. 3. S.

*Prereq:* Junior classification

History, theory and principles of Italian architecture considering relationships to the culture, visual arts, site, and surroundings. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 431: Analytical Drawing**

(1-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

Exploration of 2- and 3-dimensional representations. Emphasis on on-site freehand sketching, perspective and orthographic drawing, rendering of shadows and textures, and use of diverse media.

**ARCH 432: Advanced Computer Lighting and Rendering**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

Exploration of the computer as a design and communication tool.

Emphasis on lighting and rendering techniques.

**ARCH 433: Digital Fabrication**

(Dual-listed with ARCH 533). (3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: ARCH 433: ARCH 230; ARCH 301; Junior, Senior or equivalent skills.*

*ARCH 533: Graduate Classification and ARCH 601 or equivalent skills.*

Exploration of the computer as a design and manufacturing tool.

Emphasis on developing digital fabrication technologies and workflows.

**ARCH 434: Advanced Computer-aided Architectural Design**

(1-4) Cr. 3.

Specialized investigations of the computer as a design tool. Development of computer software and workflows for architectural and environmental problem solving.

**ARCH 436: Advanced Design Media**

(Dual-listed with ARCH 536). (2-2) Cr. 3. Repeatable, maximum of 6 credits. F.S.

Special topics in design media applications.

**ARCH 437: Architectural Photography**

(3-0) Cr. 3.

Emphasis on use of the camera and lighting in photographing drawings and interior and exterior building environments.

**ARCH 438: Architectural Robotics**

(Dual-listed with ARCH 538). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARCH 438: ARCH 231; ARCH 301; or equivalent skills. Junior or Senior or Graduate standing. ARCH 538: Graduate Standing and ARCH 601 or equivalent skills.*

Exploration of robots as design and manufacturing tools for architects.

Emphasis on developing robotic technologies and workflows with relevance to architectural design.

**ARCH 439: Computational Design Theory**

(Dual-listed with ARCH 539). (3-0) Cr. 3.

*Prereq: ARCH 220, ARCH 221, and ARCH 322 or senior classification or graduate standing.*

Seminar discussion of critical readings and theories surrounding computational design; This course surveys the history and development of digital computing and its use in design from early thought experiments, to computer-aided design systems, to present day artificial intelligences and robotics. The potentials and consequences of emerging computational design systems are discussed.

**ARCH 445: Building Science and Technology V**

(2-0) Cr. 2. F.

*Prereq: ARCH 348, ARCH 348L; concurrent enrollment in ARCH 445L.*

Final course in a sequence of architectural building technology courses comprising environmental systems, materials/assembly, and building structures topics. Using both lectures and labs, the three interrelated modules each emphasize a particular building technology subject with an overall focus on synthesizing and integrating building technologies together in sustainable design strategies. Topics include: integration of active environmental control and service systems into the design of larger scale buildings, the development of construction details for building shell and interiors, and the design and analysis of various long-span structural systems. Environmental modeling and simulation to develop the ability to integrate measurable outcomes of building performance.

**ARCH 445L: Building Science and Technology V Lab**

(0-2) Cr. 1. F.

*Prereq: ARCH 348, Arch 348L; concurrent enrollment in ARCH 445.*

Laboratory to accompany Arch 445 and must be taken concurrently.

Integrating building technologies into architectural designs through experiments and exercises in laboratory format.

**ARCH 451: Whole Building Energy Performance Modeling**

(Dual-listed with ARCH 551). (2-2) Cr. 3. S.

*Prereq: Undergraduate: ARCH 202, 346, 346L. Graduate: ARCH 544. Open to non-majors by permission of instructor.*

Architectural design, design evaluation and technical analysis using energy, daylighting, and natural ventilation performance modeling tools. Emphasis will be given to whole building energy efficiency including passive and active systems integration.

**ARCH 482: Professional Practice**

(Dual-listed with ARCH 582). (3-0) Cr. 3. F.

*Prereq: Junior classification and ARCH 371*

Emphasis on the circumstances and opportunities of the professional practice of architecture: practice as profession, process, organization, business, and evolving models of practice.

**ARCH 486: Urban Design Explorations**

(3-0) Cr. 3. S.

An investigation of urban design realities in its contemporary form as part of International study abroad program in Rome. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 490: Independent Study**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.



**ARCH 490A: Independent Study: Design Communications.**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490B: Independent Study: Design**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490C: Independent Study: Building Science and Technology**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490D: Independent Study: Architectural History**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490E: Independent Study: Behavioral Studies**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490F: Independent Study: Practice**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**ARCH 490H: Independent Study: Honors**

Cr. 1-9. Repeatable.

*Prereq: Written approval of instructor and department chair on required form*  
Independent investigation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ARCH 505: Architectural Design and Media I: Mapping, Programming, Building**

(0-12) Cr. 6. F.

*Prereq: Admission to the M Arch program. Concurrent enrollment in ARCH 545, ARCH 545L and ARCH 595.*

An introduction to comprehensive architectural design projects that focuses on three interrelated design skills: mapping, programming and building. Projects establish a framework for designing buildings that considers multiple factors such as environmental forces, construction methods, building codes, urban regulations, social relationships, and cultural values.

**ARCH 506: Architectural Design and Media II: Materiality and Representation**

(0-12) Cr. 6. S.

*Prereq: ARCH 505, ARCH 545, ARCH 545L, ARCH 595 and concurrent enrollment in ARCH 546, ARCH 546L, and ARCH 596*

Small-scale architectural design projects that investigate design representation through analogue and digital means. The projects explore different representation strategies to help students develop an understanding of the particular modes of architectural representation that advance the designer's knowledge of space as a complex interaction between materials with inherent physical characteristics, mobile socializing bodies, and changing environmental cycles.

**ARCH 507: Architectural Design and Media III: Design in Detail**

(0-10) Cr. 5. SS.

*Prereq: ARCH 506, ARCH 546, ARCH 546L, ARCH 596 and concurrent enrollment in ARCH 581*

Design projects that emphasize the multi-faceted role of the architectural detail in the design process through first, understanding the historical specificity of building construction and detailing; second, utilizing working drawing as a mode of communication; and third, designing with details.

**ARCH 516: Exhibiting Architecture**

(3-0) Cr. 3.

*Prereq: Senior or Graduate classification.*

History and theory of architectural exhibitions from the 19th century until today. Weekly readings with in-class discussions and a small curatorial project. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 517: Big and Tall: A History of Construction**

(Dual-listed with ARCH 417). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARCH 417: Junior or Senior Classification, ARCH 517: Graduate classification*

History, theory, and principles of construction from ancient times through today. Analytic project or term paper and weekly readings with discussion questions. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 518: Balkans to Baltics: Architecture and Innovation in Europe's Middle**

(3-0) Cr. 3.

*Prereq: Senior or Graduate classification.*

History and theory of 20th century architecture in East- Central Europe. Analytic project or term paper and weekly readings with in-class discussion. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 521: Celluloid Cities, Urbanism in Film**

(3-0) Cr. 3.

*Prereq: Junior classification*

Urban theory and history as manifested in popular films and videos, both fiction and documentary. Term projects require students to make short videos. (Experience with video-making not necessary.) Credits counts towards fulfillment of History, Theory, Culture requirement.

**ARCH 522: Complex Adaptive Systems Theory for the Design of Built Environments**

(3-0) Cr. 3.

*Prereq: Graduate or Senior Classification*

The principles of complex adaptive systems theory are studied and then applied towards the design of resilient and responsive built environments. Topics cover a broad spectrum, including urban informalities, tactical approaches, the capacity of digital infrastructures to coordinate distributed human practices, and emergent phenomena. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 525: Meaning and Form in Architecture**

(3-0) Cr. 3.

*Prereq: Graduate or Senior classification*

Seminar on critical analysis of meaning and form in architecture and human-made environment in various cultural contexts examined from historical and theoretical perspectives. Analytic term paper and weekly readings with discussion questions. Credit counts toward fulfillment of History, Theory, Culture requirements.

Meets International Perspectives Requirement.

**ARCH 527: History, Theory, and Criticism of Chinese Architecture**

(Dual-listed with ARCH 427). (3-0) Cr. 3. F.

*Prereq: ARCH 427: Senior classification, ARCH 527: Graduate classification*

The history and theoretical concept of Chinese built environment with emphasis on the morphology of built form and its relationship to art, landscape design, and urban structure. Credit counts toward fulfillment History, Theory, Culture.

Meets International Perspectives Requirement.

**ARCH 528: Topical Studies in Architecture**

(3-0) Cr. 2-3. Repeatable, maximum of 6 times.

**ARCH 528A: Studies in Architecture: Culture**

(3-0) Cr. 2-3. Repeatable, maximum of 6 times.

*Prereq: ARCH 220, ARCH 221, ARCH 322 or senior classification or graduate standing*

Topical offerings change by semester. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 528B: Studies in Architecture: Technology**

(3-0) Cr. 2-3. Repeatable, maximum of 6 times.

**ARCH 528C: Studies in Architecture: Communications**

(3-0) Cr. 2-3. Repeatable, maximum of 6 times.

**ARCH 528E: Studies in Architecture: Practice**

(3-0) Cr. 2-3. Repeatable, maximum of 6 times.

**ARCH 530: Formworks**

(3-0) Cr. 3. F.S.

Studies and activities showing fabrication as a means of speculation and discourse about materiality. Focus is given to the concepts and values embedded in materials and how we build at various scales.

**ARCH 531: Drawing Culture**

(3-0) Cr. 3.

*Prereq: ARCH 220, ARCH 221, ARCH 322 or senior classification or graduate standing*

Exploration of theories and practices that center on drawing as a fundamental means of knowing.

**ARCH 533: Digital Fabrication**

(Dual-listed with ARCH 433). (3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: ARCH 433: ARCH 230; ARCH 301; Junior, Senior or equivalent skills.**ARCH 533: Graduate Classification and ARCH 601 or equivalent skills.*

Exploration of the computer as a design and manufacturing tool.

Emphasis on developing digital fabrication technologies and workflows.

**ARCH 534: Topics in Computer-aided Architectural Design**

(1-4) Cr. 3. Repeatable, maximum of 6 credits. F.

Emphasis on advanced, exploratory approaches to design computing.

Projects highlight experimentation and integration of multiple media types.

**ARCH 535: Advanced Three-Dimensional Studio**

(1-4) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARCH 335 or Graduate classification*

Advanced investigation of sculptural expression with emphasis on individual projects.

**ARCH 536: Advanced Design Media**

(Dual-listed with ARCH 436). (2-2) Cr. 3. Repeatable, maximum of 6 credits. F.S.

Special topics in design media applications.

**ARCH 538: Architectural Robotics**

(Dual-listed with ARCH 438). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARCH 438: ARCH 231; ARCH 301; or equivalent skills. Junior or Senior or Graduate standing. ARCH 538: Graduate Standing and ARCH 601 or equivalent skills.*

Exploration of robots as design and manufacturing tools for architects. Emphasis on developing robotic technologies and workflows with relevance to architectural design.

**ARCH 539: Computational Design Theory**

(Dual-listed with ARCH 439). (3-0) Cr. 3.

*Prereq: ARCH 220, ARCH 221, and ARCH 322 or senior classification or graduate standing.*

Seminar discussion of critical readings and theories surrounding computational design; This course surveys the history and development of digital computing and its use in design from early thought experiments, to computer-aided design systems, to present day artificial intelligences and robotics. The potentials and consequences of emerging computational design systems are discussed.

**ARCH 540: Regimes of Perception**

(3-0) Cr. 3. F.S.

Exploration of theories, methodologies, and apparatuses of projection as a spatial and material practice. Readings and discussions accompany assignments for projection through drawing, fabrication, and performance.

**ARCH 543: Building Science and Technology I**

(4-4) Cr. 6.

*Prereq: Concurrent enrollment in ARCH 505.*

Introduction to analytical, experimental, and computational methods to understand the impacts of building physics and mechanics of the built environment on human health, safety, and welfare at building scales. Lectures and labs cover environmental forces and systems, materials & assemblies, fundamental structural principles, and digital modeling.

**ARCH 544: Building Science and Technology II**

(2-2) Cr. 3.

*Prereq: ARCH 543. Concurrent enrollment in ARCH 506.*

Extension to the understanding of fundamental building technologies and their impacts. Lectures and labs cover building assemblies, enclosure systems, structural framing components, water management, and measurable indoor environment, to further understand the impact of the built environment on human health, safety, and welfare.

**ARCH 551: Whole Building Energy Performance Modeling**

(Dual-listed with ARCH 451). (2-2) Cr. 3. S.

*Prereq: Undergraduate: ARCH 202, 346, 346L. Graduate: ARCH 544. Open to non-majors by permission of instructor.*

Architectural design, design evaluation and technical analysis using energy, daylighting, and natural ventilation performance modeling tools. Emphasis will be given to whole building energy efficiency including passive and active systems integration.

**ARCH 558: Sustainability and Green Architecture**

(3-0) Cr. 3.

*Prereq: Graduate or Senior classification*

Issues of sustainability as related to living patterns and city design, population, pollution and use and availability of natural resources for the built environment. Issues of green and sustainable architecture as related to critical thinking about methods of building material selection and systems, the environment of the United States and the world, and examples of green or sustainable building designs.

**ARCH 567: Preservation, Restoration, Rehabilitation, Cultural Heritage, and Technology**

(3-0) Cr. 3.

*Prereq: Senior classification*

Standards and procedures—including the use of current digital technologies—for preserving, restoring, reconstructing, and rehabilitating existing buildings following the guidelines of the National Park Service and the National Trust for Historic Preservation. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 568: Historic Preservation**

(3-0) Cr. 3. F.

*Prereq: Senior classification*

The history and theory of the Historic Preservation movement including an overview of the National Trust for Historic Preservation; the National Register of the Historic Places; the National Park Service; federal programs, funding sources, preservation law, national landmarks, and historic districts. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 571: Design for All People**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: Graduate or Senior classification*

Principles and procedures of inclusive design in response to the varying ability level of users. Assessment and analysis of existing buildings and sites with respect to standards and details of accessibility for all people, including visually impaired, mentally impaired, and mobility restricted users. Design is neither a prerequisite nor a required part of the course. Enrollment open to students majoring in related disciplines. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 575: Contemporary Urban Design Theory**

(3-0) Cr. 3.

*Prereq: Graduate or Senior classification*

Current urban design theory and its application to urban problems. Credit counts toward fulfillment of History, Theory, Culture requirements.

**ARCH 576: Study Abroad Options**

Cr. 1-12. Repeatable, maximum of 12 credits. SS.

Special topics in environmental design, architectural history and contemporary practice. Travel to relevant countries. General cultural and historical studies, topical projects and individual inquiry. Courses may be taught by departmental faculty or faculty from approved Iowa State Study Abroad programs. See current offerings for detailed syllabus.

Meets International Perspectives Requirement.

**ARCH 581: Making and Material Practice**

(1-12) Cr. 5. SS.

*Prereq: ARCH 506, ARCH 546, ARCH 546L, and ARCH 596*

Planning and execution of a project serving a community need. Learning occurs through both theory and active involvement in on-site work. Projects connect previous coursework to practical applications and community involvement.

**ARCH 582: Professional Practice**

(Dual-listed with ARCH 482). (3-0) Cr. 3. F.

*Prereq: Junior classification and ARCH 371*

Emphasis on the circumstances and opportunities of the professional practice of architecture: practice as profession, process, organization, business, and evolving models of practice.

**ARCH 590: Special Topics**

Cr. 1-5. Repeatable.

*Prereq: Written approval of instructor and department chair on approved form*  
Investigation of architectural issues having a specialized nature.

**ARCH 595: Seminar on the Built Environment I: History**

(3-0) Cr. 3. F.

*Prereq: Admission to the M. Arch. program and concurrent enrollment in ARCH 505, ARCH 545, and ARCH 545L*

Introduction to historical canons and traditions of architecture and urbanism. Discussion of the relationship between historical inquiry and contemporary practice. Students learn skills in critical thinking, visual analysis, and research methods. Course sessions develop thematically with interdisciplinary readings, group discussions, student presentations, and research projects.

**ARCH 596: Seminar on the Built Environment II: Landscape and Society**

(3-0) Cr. 3. S.

*Prereq: ARCH 505, ARCH 545, ARCH 545L, ARCH 595 and concurrent enrollment in ARCH 506, ARCH 546, and ARCH 546L*

Introduction to landscape as artifact and multi-disciplinary knowledge-base for design thinking. Literatures and methods of environmental psychology, cultural geography, landscape and architectural history and theory, site and circulation design as intersection of built infrastructural, natural, and social systems. Emphasis on sensory perception, and human movement; investigations of climate, environmental conditions, and values toward consumption and sustainability in everyday experience of the built environment.

**ARCH 597: Seminar on the Built Environment III: Theory**

(3-0) Cr. 3. F.

*Prereq: Graduate or Senior classification*

Multidisciplinary overview of contemporary theories concerned with the production of the built environment. Particular attention to urbanism as a discourse that relates social interactions and power structures to material space. Credit counts toward fulfillment of History, Theory, Culture requirements.

Meets International Perspectives Requirement.

**ARCH 598: Seminar on the Built Environment IV: Topical Study**

(3-0) Cr. 3. S.

*Prereq: Graduate or Senior classification*

A research seminar which considers a topic within contemporary discourses on the built environment outside of Europe and North America. The topic will be studied from multiple perspectives highlighting the historical and theoretical relationships between architecture, global cultures, geography, landscape, and urban planning. Credit counts toward fulfillment History, Theory, Culture requirements.

**Courses for graduate students:****ARCH 601: Sustainable Building Design**

(0-12) Cr. 6. F.

*Prereq: ARCH 507, ARCH 546, ARCH 546L, and ARCH 596 and concurrent enrollment in ARCH 547 and ARCH 547L*

Design projects that are developed through integrative design strategies that explore the relationship between buildings and environmental forces to maximize non-wasteful, efficient use of resources such as energy, water and building materials. Projects will include investigations of the impact of solar energy, airflow, building materials, passive and active systems and wall sections on spatial quality and form making while demonstrating synthesis of user requirements, regulatory requirements, site conditions, and accessible design. Design decisions will be quantitatively validated through energy modeling and performance simulation.

**ARCH 602: Communities, Architecture and the Environment**

(0-12) Cr. 6. S.

*Prereq: ARCH 601, ARCH 547 ARCH 547L, ARCH 597 and concurrent enrollment in ARCH 548 ARCH 548L*

Design projects that explore the relationships between architectural, cultural, and environmental landscapes. Emphasis on regional sites, socio-economic conditions, and sustainable design and planning practices at multiple scales. Projects stress engagement with local circumstances and stakeholders; systemic interconnections and strategies; and the application of interdisciplinary research.

**ARCH 603: Integrative Design**

(0-12) Cr. 6. F.

*Prereq: ARCH 602, ARCH 548 ARCH 548L*

Rigorous examination of architecture's relationship with culture and technology. Studio projects stress the interpretation of contextual and historical considerations while demonstrating broad integration and consideration of environmental stewardship, technical documentation, accessibility, site conditions, life safety, environmental systems, structural systems, and building envelope systems and assemblies. This course fulfills the Graduate College Creative Component Requirement.

**ARCH 604: Design Studio Options**

(0-12) Cr. 6. Repeatable, maximum of 12 credits. S.

*Prereq: ARCH 602*

Design studio selected by the students, which may include but is not limited to: independent design study, interdisciplinary design studio, study abroad, and design build. DSN S 546 for 6 cr. may be substituted for this course.

**ARCH 641: Building Science and Technology III**

(2-2) Cr. 3.

*Prereq: ARCH 544 or advanced standing in the M.Arch program. Concurrent enrollment in ARCH 602.*

Synthesis of building technologies and design process to understand the impacts of building technologies on occupants and the natural/urban environment. Lectures and labs cover active environmental control systems, fire safety, transportation, constructed building assemblies and details, multi-story structural design, and the utilization of computational simulations.

**ARCH 642: Building Science and Technology IV**

(2-2) Cr. 3.

*Prereq: ARCH 641. Concurrent enrollment in ARCH 601.*

Explorations of emerging building technologies and their impacts on the environment and society. A view into emerging technologies in architecture with an emphasis on adaptability through experimentation and inquiries. Topics include novel materials, assembly techniques, long-span structural systems, renewable energy production, and smart systems.

**ARCH 690: Independent Design Study**

(1-15) Cr. 6. Repeatable.

*Prereq: Admission to the M. S. in Arch. program*

Independent architectural design projects commensurate with student interests requiring approval of Architecture Graduate Committee.

**ARCH 698: Graduate Seminar**

Cr. R. Repeatable. F.S.

*Prereq: Admission to the M. Arch. or M. S. in Arch. programs*

Special topics and guest speakers.

**ARCH 699: Research**

(1-18) Cr. 3-9. Repeatable.

Research.

## Art Education (ARTED)

***Any experimental courses offered by ARTED can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****ARTED 209: Methods of Teaching in and Through Art**

(0-4) Cr. 2. F.S.

*Prereq: Sophomore classification*

Methods of teaching in and through visual art are experienced and applied in this course. Art-centered and interdisciplinary art education methods for K-8 teaching are designed to develop creativity, authentic expression, collaboration, aesthetic sensitivity and pluralistic, global perspectives.

**ARTED 211: Introduction to Art Education**

(0-6) Cr. 3. F.S.

*Prereq: Sophomore classification*

Teaching methods for K-12 art education. Hands-on discipline-specific and integrated art activities are experienced and designed; emphasis is on creativity, artistic and human diversity, community building, and development of thinking skills in holistic, pluralistic art education.

**ARTED 490: Independent Study**

Cr. arr. F.

*Prereq: Permission of Instructor*

## Art History (ART H)

***Any experimental courses offered by ART H can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**ART H 280: History of Art I**

(3-0) Cr. 3. F.

Development of the visual arts including painting, sculpture, architecture, and crafts, from the prehistoric through Gothic periods.

Meets International Perspectives Requirement.

**ART H 281: History of Art II**

(3-0) Cr. 3. S.

Development of the visual arts of western civilization including painting, sculpture, architecture, and crafts; from the Renaissance to the twentieth century.

Meets International Perspectives Requirement.

**ART H 281H: History of Art II: Honors**

(3-0) Cr. 3. S.

Development of the visual arts of western civilization including painting, sculpture, architecture, and crafts; from the Renaissance to the twentieth century.

Meets International Perspectives Requirement.

**ART H 292: Introduction to Visual Culture Studies**

(3-0) Cr. 3.

An introduction to various topics in visual culture studies, including significant trends in the visual arts, mass media, scientific imagery, visual communications, and other areas related to visual literacy and visual representation in local and global contexts. Cross cultural viewpoints and issues of diversity will be presented in relation to visual culture.

**ART H 293: Origins and Evolution of Modern Design**

(3-0) Cr. 3.

History of designed artifacts, their creators, and their cultural environments in Europe and America from the beginning of the Industrial Revolution to the present.

**ART H 382: Art and Architecture of Asia**

(3-0) Cr. 3.

Introduction to histories of art and architecture in Asia before the modern era. Cultures may include China, Korea, Japan, and India. Art traditions of Asia are explored in relation to their cultural, historical, and religious contexts.

Meets International Perspectives Requirement.

**ART H 383: Greek and Roman Art**

(Cross-listed with CL ST). (3-0) Cr. 3.

Greek art from Neolithic to Hellenistic periods. Roman art from the traditional founding to the end of the empire in the West.

**ART H 383H: Greek and Roman Art: Honors**

(Cross-listed with CL ST). (3-0) Cr. 3-4.

Greek art from Neolithic to Hellenistic periods. Roman art from the traditional founding to the end of the empire in the West.

**ART H 384: Art of Islam**

(3-0) Cr. 3.

Historical survey of the painting, sculpture, crafts, and architecture of the various civilizations of the Islamic world.

Meets International Perspectives Requirement.

**ART H 384H: Art of Islam, Honors**

(3-0) Cr. 3-4.

Historical survey of the painting, sculpture, crafts, and architecture of the various civilizations of the Islamic world.

Meets International Perspectives Requirement.

**ART H 385: Renaissance Art**

(3-0) Cr. 3.

European art including painting, sculpture, architecture, and crafts; thirteenth through sixteenth centuries.

**ART H 385H: Renaissance Art, Honors**

(3-0) Cr. 3-4.

European art including painting, sculpture, architecture, and crafts; thirteenth through sixteenth centuries.

**ART H 386: American Art to 1945**

(3-0) Cr. 3.

Survey of American art from the early colonial period to 1945, with emphasis on historical and cultural issues that underlie art production in the United States.

**ART H 388: Modern Art and Theory**

(3-0) Cr. 3.

Visual arts and critical theory of the late 19th and early 20th centuries, including Expressionism, Cubism, Futurism, Suprematism, Dada, and Surrealism.

**ART H 395: Art and Theory Since 1945**

(3-0) Cr. 3.

Visual arts and critical theory after 1945, including Abstract Expressionism, Pop Art, and Performance Art.

**ART H 396: History of Photography**

(3-0) Cr. 3.

Survey of the evolution of photography and photojournalism from the 1830s to the present, seen from an art historical perspective, emphasizing causative factors, cultural influences, and major masters and schools.



**ART H 460: The World on Display**

(3-0) Cr. 3.

Survey of world's fairs and other international exhibitions, focusing on their displays of art, manufacturing, luxury goods and industrial products, and relating to overarching discourses of nationalism, colonialism, and political supremacy as they were articulated within the exhibitions.

**ART H 486: Art History Field Study**

Cr. R. Repeatable.

*Prereq: Concurrent enrollment in an ART H course; Permission of Instructor*

Study and tours of museums, galleries, artist and/or designer studios and other areas of interest within art history. Offered on a satisfactory-fail basis only.

**ART H 487: Nineteenth-Century Art**

(3-0) Cr. 3.

European and American art and architecture from 1780 to 1900 focusing on the major movements of western Europe, including Neoclassicism, Romanticism, Realism, Impressionism, and Post-Impressionism.

**ART H 489: History of Comics**

(Dual-listed with ART H 589). (3-0) Cr. 3.

An art-historical survey of comic strips, comic books, and graphic novels from their origins in the 19th century to present.

**ART H 489H: History of Comics: Honors**

(3-0) Cr. 3-4.

An art-historical survey of comic strips, comic books, and graphic novels from their origins in the 19th century to present.

**ART H 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form before the semester of enrollment*

Student must have completed art history coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ART H 490H: Independent Study, Honors**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form before the semester of enrollment*

Student must have completed art history coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ART H 491: Art History in Europe Seminar**

(1-0) Cr. 1.

*Prereq: Permission of instructor and planned enrollment in ART H 492*

Cultural and historical aspects of art and design in Western Europe in preparation for study abroad. Area of study varies each time offered.

Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

**ART H 492: Art History in Europe**

(Dual-listed with ART H 592). (3-0) Cr. 3.

*Prereq: ART H 492: ART H 491; Permission of Instructor. ART H 592: Graduate classification; Permission of Instructor*

International study abroad program in western Europe. Visits to design studios, art museums, and educational facilities. Related activities depending on specific area of study which may vary each time offered.

Meets International Perspectives Requirement.

**ART H 494: Women/Gender in Art**

(Cross-listed with WGS). (3-0) Cr. 3.

Issues of gender related to cultural environments from the Middle Ages to contemporary times in Europe and America. Feminist movement beginning in the 1970s and specifically gender issues in art that are becoming widespread in the artistic culture.

**ART H 497: Museum/Gallery Internship**

Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: Written approval of supervising instructor on required form in advance of semester of enrollment.*

Supervised experience with a cooperating museum or gallery or art center. Offered on a satisfactory-fail basis only.

**ART H 498: Selected Topics in Art History**

(Dual-listed with ART H 598). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Specialized study in the history or criticism of art and/or design.

**ART H 499: Visual Culture Studies Writing and Methods Seminar**

(3-0) Cr. 3.

Sustained exploration of topics related to Visual Culture Studies. Course incorporates introduction to methods central to the field of visual culture studies, writing exercises, and guided instruction in the process of conducting research and reporting results of the research process. Course will result in an original paper.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ART H 501: Issues in Visual and Material Culture Seminar**

(3-0) Cr. 3.

*Prereq: Permission of instructor*

Issues and debates that pertain to the study of visual objects and material artifacts in their cultural context. Examination of the role of visual and material culture studies as both relate to allied disciplines including, but not limited to: anthropology, art history, design history, design studies, and new media studies.

**ART H 586: Museum/Gallery Internship**

Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification and permission of instructor. Written approval in advance of semester of enrollment.*

Supervised experience with a cooperating museum or gallery or art center. Offered on a satisfactory-fail basis only.

**ART H 587: Nineteenth Century Art**

(3-0) Cr. 3.

European and American art and architecture from 1780 to 1900, focusing on the major movements of western Europe, including Neoclassicism, Romanticism, Realism, Impressionism, and Post-Impressionism.

**ART H 588: Modern Art and Theory**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Visual arts and critical theory of the late 19th and early 20th centuries, including Expressionism, Cubism, Futurism, Suprematism, Dada and Surrealism.

**ART H 589: History of Comics**

(Dual-listed with ART H 489). (3-0) Cr. 3.

An art-historical survey of comic strips, comic books, and graphic novels from their origins in the 19th century to present.

**ART H 590: Special Topics**

Cr. arr.

*Prereq: Graduate classification; written approval of instructor and department chair on required form in advance of semester of enrollment.*

Independent Study in Art History.

**ART H 592: Art History in Europe**

(Dual-listed with ART H 492). (3-0) Cr. 3.

*Prereq: ART H 492; ART H 491; Permission of Instructor. ART H 592: Graduate classification; Permission of Instructor*

International study abroad program in western Europe. Visits to design studios, art museums, and educational facilities. Related activities depending on specific area of study which may vary each time offered. Meets International Perspectives Requirement.

**ART H 594: Women/Gender in Art**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Issues of gender related to cultural environments from the Middle Ages to contemporary times in Europe and America. Feminist movement beginning in the 1970s and specifically gender issues in art that are becoming widespread in the artistic culture.

**ART H 595: Art and Theory Since 1945**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Visual arts and critical theory after 1945, including Abstract Expressionism, Pop Art, and Performance Art.

**ART H 596: History of Photography**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Survey of the evolution of photography and photojournalism from the 1830s to the present, seen from an art historical perspective, emphasizing causative factors, cultural influences, and major masters and schools.

**ART H 597: Green Art: Earthworks and Beyond**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Seminar covering aspects of art and design based on ecological principles, including earthworks, land-based art, recycled/reused objects, ecofeminism, ephemerality, and green design.

**ART H 598: Selected Topics in Art History**

(Dual-listed with ART H 498). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Specialized study in the history or criticism of art and/or design.

## Astronomy and Astrophysics (ASTRO)

*Any experimental courses offered by ASTRO can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**ASTRO 102: North Star Astronomy**

Cr. 1. F.S.SS.

An entirely web-based course covering topics in observing the sky and navigation by the stars for students with little or no previous experience. The course combines material on common naked-eye phenomena, such as daily and seasonal variations in the sky, with information on how these helped navigators determine where they are on Earth. The course "lectures" are on-line, interactive units with built-in exercises, hands-on (offline) activities and layers of help. Graded homework and quizzes are administered via Canvas. Students who take Astro 120 may count credit in only one of Astro 102 or 103 toward graduation.

**ASTRO 103: Evening Star**

Cr. 1. F.S.SS.

An entirely web-based course covering topics in celestial mechanics ("Rocket science!") for students with little or no previous experience. It combines the geography of the solar system with discussion of methods of traveling to the other planets. The course "lectures" are on-line, interactive units with built-in exercises, hands-on (offline) activities, and layers of help. Graded homework and quizzes are administered via Canvas. Students who take Astro 120 may count credit in only one of Astro 102 or 103 toward graduation.

**ASTRO 120: The Sky and the Solar System**

(3-0) Cr. 3. F.S.SS.

For the nonscientist. A survey of our view of the universe, and the exploration of the solar system and beyond. The sky: constellations; motions of the Sun, Moon, and planets; seasons and the calendar; eclipses. The solar system: origin and evolution; characteristics of the Sun, planets, satellites, comets, meteorites, and asteroids. The detection and characterization of other solar systems, and the search for life in the universe. Extensive use of the planetarium is included. Students who take Astro 120 may count credit in only one of Astro 102 or 103 toward graduation.

**ASTRO 150: Stars, Galaxies, and Cosmology**

(3-0) Cr. 3. F.S.

For the nonscientist. A survey of astronomy with a focus on the universe beyond our solar system. Basic observational astronomy and the history of astronomy. Stellar astronomy: motions, distances, sizes, spectra; types of stars; variability; binary systems. Stellar evolution: the birth, life, and death of stars, including supernovae, neutron stars, and black holes. The structure and evolution of the Milky Way Galaxy. Other galaxies, clusters of galaxies, quasars. Theories of the origin of the universe.

**ASTRO 250: Astronomy Bizarre**

(3-0) Cr. 3. S.

*Prereq: ASTRO 120 or ASTRO 150*

For the nonscientist. A small enrollment course examining new and exciting topics in modern astronomy. Galaxy and star formation. Black holes and pulsars. Colliding galaxies. Quasars. Dark Matter. Dark energy. Quasars. Cosmology, the Big Bang and the future of the universe. Prospects and searches for extraterrestrial life.

**ASTRO 290: Independent Study**

Cr. 1-4. Repeatable.

*Prereq: Permission of Instructor***ASTRO 342: Introduction to Solar System Astronomy**

(3-0) Cr. 3. F.

*Prereq: PHYS 222 or (PHYS 232 and 232L) or PHYS 242*

An introduction to the physics of the Solar System and the planetary systems discovered around other stars. General characteristics of planetary systems: dynamics, thermodynamics, internal and surface structure of planets and minor bodies, physics of their atmosphere. Discovery techniques and characterization of extrasolar planets, and planetary systems formation models. "Grand tour" of the Solar System, using data and imagery from probes and telescopes that have visited these worlds. The origin and evolution of life on Earth, and the ongoing search for life in the Solar System and elsewhere in the universe.

**ASTRO 344L: Astronomy Laboratory**

(1-6) Cr. 3. F.

*Prereq: PHYS 222 or (PHYS 232 and 232L) or 242*

Experiments in optical astronomy. Observational techniques, ranging from stellar photometry to CCD imaging. Data processing and analysis techniques. Astronomical software packages and online databases and resources. Available instruments include a variety of small telescopes and astronomical CCD cameras.

**ASTRO 346: Introduction to Astrophysics**

(3-0) Cr. 3. S.

*Prereq: PHYS 222 or (PHYS 232 and 232L) or PHYS 242*

An exploration of the universe beyond our Solar System, with emphasis on the astrophysics of stars and galaxies. Observable properties of stars, physics of stellar atmospheres and interiors. Birth, evolution and death of stars, to understand the past and future of our Sun, the Milky Way galaxy and the other galaxies in the universe. Basic concepts of cosmology, dark matter and dark energy. Use of computer models to calculate the structure and evolution of stars and protostars, and to analyze actual astronomical data obtained by professional astronomers.

**ASTRO 405: Astrophysical Cosmology**

(Dual-listed with ASTRO 505). (3-0) Cr. 3. S.

*Prereq:* 405: ASTRO 346 or Permission of Instructor

Introduction to modern cosmology and large-scale structure; mathematical and observational fundamentals associated with the origin, structure, and evolution of the Universe. Scale of the Universe, Hubble's Law, the cosmic microwave background, Big Bang nucleosynthesis, the origin of elements, dark energy and the accelerating universe, and dark matter. For senior undergraduates and graduate students in all areas of physics.

**ASTRO 450: Undergraduate Research**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq:* Permission of Instructor

Research under supervision of astronomy faculty.

**ASTRO 450L: Undergraduate Research**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq:* ASTRO 344L; Permission of Instructor

Laboratory or observational project under supervision of astronomy faculty.

**ASTRO 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq:* 6 credits in ASTRO; Permission of Instructor

No more than 9 credits of Astro 490 may be counted toward graduation.

**ASTRO 490H: Independent Study: Honors**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq:* 6 credits in ASTRO; Permission of Instructor

No more than 9 credits of Astro 490 may be counted toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ASTRO 505: Astrophysical Cosmology**

(Dual-listed with ASTRO 405). (3-0) Cr. 3. S.

*Prereq:* 405: ASTRO 346 or Permission of Instructor

Introduction to modern cosmology and large-scale structure; mathematical and observational fundamentals associated with the origin, structure, and evolution of the Universe. Scale of the Universe, Hubble's Law, the cosmic microwave background, Big Bang nucleosynthesis, the origin of elements, dark energy and the accelerating universe, and dark matter. For senior undergraduates and graduate students in all areas of physics.

**ASTRO 510: Observational Astrophysics**

(2-3) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq:* ASTRO 405 or ASTRO 505 or permission of instructor

Techniques in optical and near-IR astronomy, including spectroscopy and CCD photometry. Emphasis on projects involving proficiency in the use of research telescopes and modern instrumentation. Project topics range from photometric studies of pulsating and binary star systems to deep CCD imaging of faint nebulae and galaxies.

**ASTRO 580: Stellar Astrophysics**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq:* ASTRO 405 or ASTRO 505 or permission of the instructor

The interior structure and atmospheric properties of stars: Stellar structure equations and constitutive relations: energy generation, energy transport by radiation and convection; equation of state, nuclear energy generation and nucleosynthesis. Numerical and analytic solutions to the equations of structure and evolution. Observational connections through the theory of radiative transfer. Line and continuum processes and sources of opacity. Non-LTE and statistical equilibrium. Line profiles. Interpretation of stellar spectra: temperature, pressure, and abundance determinations. Stellar evolution from formation to final phases.

**ASTRO 582: High Energy Astrophysics**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq:* ASTRO 405 or ASTRO 505 or permission of the instructor

Interactions of high-energy particles, non-thermal radiation processes, spectral evolution of non-thermal systems, cosmic rays, active galactic nuclei, pulsars, neutrinos, measurement techniques for relativistic charged particles, high energy photons, and neutrinos.

**ASTRO 584: Galactic Astronomy**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq:* ASTRO 405 or ASTRO 505 or permission of instructor

Overall structure of our Galaxy and the interstellar medium. Physical processes in the interstellar medium (e.g., heating and cooling mechanisms, turbulence). Observational techniques for studying the interstellar medium. Kinematics and chemical evolution of the Galaxy.

**ASTRO 586: Extragalactic Astronomy**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq:* ASTRO 405 or ASTRO 505 or permission of the instructor

Galaxy evolution, dynamics of external galaxies, evolution and classification of galaxies, groups and clusters of galaxies, extragalactic radio sources, quasars, structure formation, cosmological models and their observational consequences.

**ASTRO 590: Special topics**

Cr. arr. Repeatable.

**ASTRO 599: Creative Component**

Cr. arr.

*Prereq: Permission of instructor*

Individually directed study of research-level problems for students electing the nonthesis M.S. option in astronomy.

**Courses for graduate students:****ASTRO 650: Advanced Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest in astronomy and astrophysics. Offered on a satisfactory-fail basis only.

**ASTRO 675: Advanced Stellar Astrophysics**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: ASTRO 580 or permission of instructor*

Advanced topics in stellar astrophysics. Dynamic and extended atmospheres, chromospheres, coronae, and stellar winds. MHD, stellar activity, and dynamo theory. Radiative transfer and the transition from extended atmospheres to the interstellar medium. Diffusive processes in stellar atmospheres and interiors. Techniques for quantitative analysis of planetary and stellar spectra including detailed modeling and spectrum synthesis. Evolution in interacting binaries. Nucleosynthesis II. Variable stars. Supernovae. Neutron stars and black holes.

**ASTRO 699: Research**

Cr. arr. Repeatable.

## Athletic Training (A TR)

*Any experimental courses offered by A TR can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****A TR 217: Clinical Practicum in Athletic Training I**

Cr. 1. S.

*Prereq: A TR 221; Permission of Athletic Training Program Director*

Athletic training clinical experiences for pre-athletic training students. Offered on a satisfactory-fail basis only.

**A TR 218: Orientation to Athletic Training Clinical Experience**

(0-2) Cr. 0.5. Repeatable, maximum of 1 credits. F.S.

Pre-athletic training clinical experience designed to orientate students to the athletic training profession prior to enrolling in athletic training course sequence. Students will observe athletic trainers in various athletic training clinical sites. Open to pre-athletic training students only. Offered on a satisfactory-fail basis only.

**A TR 219: Anatomy Clinical Practicum**

(0-2) Cr. 1. S.

Athletic training clinical experiences designed to review human anatomical structures including origin, insertion, action, innervations of muscles. Students will gain experience with palpation of these structures to help identify location of anatomical landmarks. Students will also gain experience identifying bones, ligaments, and tendons. Open to athletic training students only.

**A TR 220: Basic Athletic Training**

(1-2) Cr. 2.

*Prereq: (BIOL 155 or BIOL 255); BIOL 256*

Introduction to methods of prevention and immediate care of athletic injuries. Basic information concerning health supervision of athletes, and some basic wrapping and strapping techniques for common injuries.

**A TR 221: Pre-Athletic Training Clinical Practicum**

(0-3) Cr. 1. F.

Athletic training clinical observation experiences to accompany A TR 220. Utilize knowledge to evaluate, analyze and demonstrate appropriate taping, wrapping and basic skill techniques. Open to students interested in the athletic training option. Offered on a satisfactory-fail basis only.

**A TR 223: Preseason Clinical Experience Practicum**

(0-3) Cr. 1. F.

*Prereq: Permission of Clinical Coordinator*

Athletic training clinical experiences for athletic training students during pre-season intercollegiate football. Clinical experiences include: Emergency care, splinting and spinal immobilization, medical record keeping and HIPPA regulations, environmental conditions, prevention of injury screening strategies, athletic training room and education program policies and procedures, review of athletic taping techniques, acute injury management, and anatomy review. Offered on a satisfactory-fail basis only.

**A TR 228: Basic Orthopedic Assessment and Evaluation Principles**

Cr. 2. F.

*Prereq: A TR 219*

Assessment procedures and evaluation techniques for upper and lower body orthopedic conditions and injuries. Includes an overview of mechanisms of injury, general musculoskeletal disorders, spine or neurological dysfunction.

**A TR 229: Clinical Practicum in Athletic Training II**

Cr. 1. F.

*Prereq: Concurrent enrollment in A TR 228*

Pre-Athletic training clinical experiences designed to orientate students to the assessment and evaluation principles of upper and lower body orthopedic conditions and injuries. Pre-athletic training students will observe athletic trainers in various athletic training clinical sites. Concurrent enrollment in A TR 228. Offered on a satisfactory-fail basis only.

**A TR 328: Athletic Injuries Clinical Practicum**

Cr. 1.

*Prereq: A TR 229*

Athletic training clinical experiences for pre-athletic training students. Clinical experiences include: prevention of injury screening strategies, athletic training room and education program policies and procedures, review of athletic taping techniques, acute injury management, and anatomy review. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**A TR 501: Bracing, Wrapping, and Taping Techniques**

(0-3) Cr. 1.

*Prereq: Acceptance into Athletic Training program*

Methods to select, fabricate, and/or customize prophylactic, assistive, and restrictive devices, material, and techniques into plan of care (durable medical equipment, orthotic devices, taping, bracing, splinting, protective padding, and casting). Methods of taping and wrapping for injury care, mitigation of injury, and return to play. Exposure to different brands of bracing, how to fit a brace, and their use as well as casting techniques. Discussions of when to refer for prosthetics and overview of gait training.

**A TR 502: Emergency Care Procedures in Athletic Training**

(3-0) Cr. 3. SS.

*Prereq: Acceptance into Athletic Training program*

Overview of medical emergencies and other critical incidents that may occur. Evaluate and manage patients with acute conditions including triaging conditions and internal/external hemorrhage. Cardiac, respiratory, and cervical spine compromise. Conditions related to environment, fractures, dislocations, and wound care and closure. Concussion/brain injury with consideration of established protocols including: comprehensive examination, recognition, and treatment, implementation of a plan of care, referral, and return to participation.

**A TR 505: Therapeutic Modalities and Clinical Interventions**

(2-2) Cr. 3. F.

*Prereq: A TR 502, A TR 520, acceptance into Athletic Training program*

Knowledge and skills to utilize a variety of therapeutic modalities. Detailed understanding of the psychological and physiological process of pain, healing and a problem-based approach to apply theories, principles, and techniques of thermal, electrical, mechanical, light, and alternative therapies (laser, cryotherapy). Incorporation interventions (for pre-, post-, and non-surgical conditions) designed to address a patients' identified impairments, activity limitations, injuries, and participation restrictions. Home care to include self-treatment, soft tissue techniques.

**A TR 509: Athletic Training Clinical Education I**

Cr. 1. SS.

*Prereq: Acceptance into Athletic Training program*

Clinical experiences under the direct supervision of a clinical preceptor. Techniques and clinical skills provided in both the clinical and classroom settings including: Special Olympics, emergency department rotation, environmental conditions, off season practice and conditioning sessions, biometrics/physiological monitoring systems and translation of data into effective preventative measures, clinical interventions, and performance enhancement.

**A TR 510: Evaluation Methods and Treatment Techniques - Lower Body**

(2-2) Cr. 3. F.

*Prereq: A TR 502, A TR 520, acceptance into Athletic Training program*

Proper methods of musculoskeletal evaluation of the lower extremity. Evaluate and manage patient(s) with acute conditions including triaging conditions that are life threatening or otherwise emergent. Obtain a medical history, proper methods of documentation, patient overview (including ICF model), identification of comorbidities, assessment of function, selection and use of special tests and measures assessing patient's clinical presentation, clinical practice decisions, evaluation of all results to determine a plan of care, including referral when warranted. Selection and incorporations of interventions designed to address a patient's identified impairments, activity limitations, and participation restriction.



**A TR 513: Evaluation Methods and Treatment Techniques - Upper Body**  
(3-0) Cr. 3. S.*Prereq: A TR 510, A TR 521, acceptance into Athletic Training program*

Proper methods of musculoskeletal evaluation of the upper extremity including spine. Evaluate and manage patient(s) with acute conditions. Obtaining a medical history, methods of documentation, assessment of function, selection and use of special tests and measures assessing patient's clinical presentation, determine a plan of care, including referral when warranted. Selection and incorporations of interventions designed to address a patient's identified impairments, activity limitations, and participation restrictions, using ICF model for clinical practice decisions. Review of concussion evaluation, protocols, and return to play following a head injury/concussion.

**A TR 515: Evidence-based Practice in Athletic Training**  
(2-0) Cr. 2. SS.*Prereq: A TR 522, A TR 545, acceptance into Athletic Training program*

Principles of evidence-based practice, search for evidence, grading and evaluating literature. Use of systems of quality assurance and improvement to enhance patient care, search, retrieve, and incorporating the use of contemporary principles and practices information from health informatics for clinical decisions and communication with patients/clients, family members, coaches, administrators, other healthcare providers, consumers, payors, and/or policy makers. Use of the International Classification of Functioning, Disability, and Health (ICF) as a framework for delivery and communication about patient care.

**A TR 519: Athletic Training Clinical Education II**  
Cr. 3. F.*Prereq: A TR 510, A TR 521, acceptance into Athletic Training program*

Clinical experiences under the supervision of a clinical preceptor with client/patient populations in competitive, recreational, individual and team activities, with foundational behaviors of professional practice. Real client/patient interactions as well as assessment of clinical component procedures and policies. Clinical hours occur in a variety of settings with patients and the student will complete the clinical hours that may extend prior to and/or beyond the academic semester end date. Clinical opportunities provide a basis for evaluating the athletic training student's clinical progression through the program.

**A TR 520: Athletic Training Seminar A - An Introduction to Athletic Training**  
(1-0) Cr. 1. SS.*Prereq: Acceptance into Athletic Training program*

Introduction to athletic training program and an overview of policies and procedures, and program handbook. History of athletic training, professional domains, electronic health records, ethics, cultural competence, social justice, HIPPA, and FERPA confidentiality, and professionalism.

**A TR 521: Athletic Training Seminar B - Diagnostic Imaging and Lab Principles**

(1-0) Cr. 1. F.

*Prereq: A TR 502, A TR 520, acceptance into Athletic Training program*

Procedures on obtaining via the appropriate physician and medical staff the necessary and appropriate diagnostic tests or labs to facilitate diagnosis, referral, and treatment planning. Using evidence to inform practice and utilize systems of quality assurance and improvement to enhance patient care. Communicate and collaborate with other medical interprofessionals including radiologists, x-ray technicians, medical laboratory scientists and clinical lab technicians for best patient care and outcomes.

**A TR 522: Athletic Training Seminar C - Interprofessional Collaboration and Leadership**

(1-0) Cr. 1. S.

*Prereq: A TR 510, 521, acceptance into Athletic Training program*

Explore other allied health care professions and interprofessional collaboration for optimal patient care and referral. Total patient care and how different professions can impact the care will be explored and discussed. Participation in roundtable discussions with other interprofessional health professions and students are exposed to foundational behaviors of professional practice including but not limited to: communication, work/family balance, ethics, mentorship, leadership, professional involvement, and promotion of the profession.

**A TR 523: Athletic Training Seminar D - Advanced Topics in Athletic Training**

(1-0) Cr. 1. SS.

*Prereq: A TR 522, A TR 545, acceptance into Athletic Training program*

Advanced clinical experiences and specialty training that includes exposure to soft tissue mobilization techniques, gait analysis and sport science technologies related to injury mitigation and sport performance.

**A TR 524: Athletic Training Seminar E - Professional Development in Athletic Training**

(2-0) Cr. 1. S.

*Prereq: A TR 515, A TR 550, and permission of the Athletic Training Program Director*

Assess the athletic training students' mastery of knowledge and clinical skills in athletic training, prepare students for employment, continuing education, and self-assessment. Utilizes a case study approach covering all of the domains of athletic training and demonstrates interprofessional and interdisciplinary connections. Review of all of the athletic training domains via specific exams (written, simulation and computer based) will be utilized to prepare the student to challenge the BOC examination.

**A TR 529: Athletic Training Clinical Education III**

Cr. 3. S.

*Prereq: A TR 510, A TR 521, A TR 519, acceptance into Athletic Training program*

Clinical experiences under the supervision of a clinical preceptor with client/patient populations in competitive, recreational, individual and team activities, high and low intensity activities with foundational behaviors of professional practice. Real client/patient interactions as well as assessment of clinical component procedures and policies. Clinical hours occur in a variety of settings with patients and the student will complete the clinical hours that may extend prior to and/or beyond the academic semester end date. Clinical opportunities provide a basis for evaluating the athletic training student's clinical progression through the program.

**A TR 539: Athletic Training Clinical Education IV**

Cr. 2. SS.

*Prereq: A TR 522, A TR 545, A TR 529, acceptance into Athletic Training program*

General medicine clinical experiences under the direct supervision of a clinical preceptor. Advanced issues in the athletic training profession with emphasis on practical application and professional development, and collaboration with other health care professionals. Utilization of evidenced based research and approaches to clinical practice with emphasis placed on lab reports, imaging results, life-span issues, and diverse patient populations including non-sport client/patient populations, different sexes and throughout the lifespan (pediatric, adult, elderly). Foundational behaviors of professional practice and emphasis will focus on evaluation, treatment, rehabilitation, and clinical skills.

**A TR 545: Therapeutic Exercise and Rehabilitation Interventions**

(2-2) Cr. 3. S.

*Prereq: A TR 510, A TR 521, acceptance into Athletic Training program*

Therapeutic and corrective exercise, joint mobilization, soft tissue techniques, movement training (including gait training), motor control/proprioceptive activities, task-specific functional training, home and self-care including self-treatment and exercise, cardiovascular training. Pre-, post-, and non-surgical conditions and addressing activity limitations, patient goals, participation restrictions, quality assurance and quality improvement, patient reported outcomes, and return to play guidelines.

**A TR 549A: Athletic Training Clinical Education Study Abroad: Preparing for the Experience**

Cr. 1. S.

*Prereq: In addition to the study abroad application requirements, students must be accepted into their intended program, must be a sophomore or junior classification, or graduate student majoring in Athletic Training, minimum GPA of 3.0, and completion of A TR 220, or A TR 229.*

Preparation for a study abroad experience that is focused on the discipline of athletic training in another country. Pre-travel for A TR 549B study abroad experience.

Meets International Perspectives Requirement.

**A TR 549B: Athletic Training Clinical Education Study Abroad**

Cr. 1-3. S.

*Prereq: Accepted to study abroad by the A TR Program Director and passing A TR 549A.*

First-person perspective into the athletic training profession in another country as well as provide enrichment experiences related to the history and culture of that country. Follow-up course and experience of one credit A TR 549A which was intended to prepare the student for the study abroad experience.

Meets International Perspectives Requirement.

**A TR 550: Pharmacological Issues in Athletic Training**

(2-0) Cr. 2. SS.

*Prereq: A TR 522, A TR 545, acceptance into Athletic Training program*

General medical and pharmacological issues generally found in the field of athletic training. Medications used to treat medical conditions and the ability to educate patients regarding appropriate pharmacological agents for the management of their condition, including indications, contraindications, dosing, interactions, and adverse reactions.

Administration of medications by the appropriate route upon the order of a physician or other provider with legal prescribing authority. Educate clients/patients about effects, participation consequences, risks of misuse and abuse of alcohol, performance-enhancing drugs/substances; and over the counter, prescription and recreational drugs including drug testing policies and procedures.

**A TR 559: Athletic Training Clinical Education V**

Cr. 4. F.

Course monitors student progression of athletic training proficiencies, acquiring clinical skills under the direct supervision of a clinical preceptor. Field experience provides additional athletic training experiences and clinical responsibilities for a minimum of two 8 week rotations under the direct supervision of a clinical preceptor. Required to complete a minimum of 25 hrs per week of field clinical experience. Clinical experience may extend beyond the academic semester end date and the clinical hours are a component of this course.

**A TR 560: General Medical and Behavioral Health Issues**

(3-0) Cr. 3. SS.

*Prereq: A TR 522, A TR 545, acceptance into Athletic Training program*

Medical issues generally observed in the athletic training profession. Development and implementation of wellness strategies to mitigate the risk for long-term health conditions across the lifespan and in an active population. Topics including dermatology, mental illness, neurological disorders, pulmonary disease, respiratory infections, viral infections, autoimmune disorders, oncology, gastrointestinal conditions and sexually transmitted infections. Identify, refer, give support to patients with behavioral health conditions and interact with other healthcare providers.

**A TR 569: Athletic Training Immersion Clinical Education VI**

Cr. 5. S.

*Prereq: Permission of Athletic Training Program Director*

Cumulative clinical experience to gain a more in-depth experience in the field of athletic training. Student selects a field or site experience that meets their professional goals. Field experience is designed to provide immersive and additional athletic training experiences for a minimum of 10 weeks under the direct supervision of a certified athletic trainer. Site approved by the preceptor and A TR program director prior to beginning the immersion clinical experience. Required to complete a minimum of 25 hours per week of field experience. Clinical experience may extend beyond the academic semester end date and the clinical hours are a component of this course.

**A TR 570: Injury Intervention, Rehabilitation and Patient Care**

(2-2) Cr. 3. F.

*Prereq: A TR 515, A TR 550, A TR 560 and acceptance into Athletic Training program*

Basic understanding of injury and sport psychology and its application to the overall health and well-being of athletic and general population clients. Psychological, social, socio-economical, and environmental factors that influence a client/patient and in their injury susceptibility, reaction, immediate care, and adherence to rehabilitation will be explored. Assessment and intervention techniques to promote and facilitate rehabilitation in a variety of professional settings and with patients from different backgrounds and social issues that may impact a patient. Overview of special populations (adolescent, female, special populations of athletes/physically active patients). Foundational behaviors of professional practice and working with other allied health care professionals in the overall health and well-being of a patient will be explored.

**A TR 575: Athletic Training Organization and Administration**

(3-0) Cr. 3. S.

*Prereq: Concurrently enrolled in A TR 569.*

Knowledge and skills necessary for the administration aspect of an athletic training program. Course content includes but is not limited to: PPEs, how to manage physical, human, and financial resources in the delivery of healthcare services. Discussion of patient and insurance management, working relationships with interprofessional members of the health care team, policies and procedures for guidance in the daily operation of athletic training services including EAP or other critical incidents (concussion or other brain injuries), patients in behavioral health crisis, record keeping, athletic training facility design, resume development, and administrative/leadership skills and mentoring.

## Athletics (ATH)

**Courses primarily for undergraduates:****ATH 101: Intercollegiate Athletics**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101B: Intercollegiate Athletics: Basketball (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101C: Intercollegiate Athletics: Basketball (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101D: Intercollegiate Athletics: Cross Country (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101E: Intercollegiate Athletics: Cross Country (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101F: Intercollegiate Athletics: Football (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101G: Intercollegiate Athletics: Golf (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101J: Intercollegiate Athletics: Gymnastics (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101K: Intercollegiate Athletics: Softball (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101M: Intercollegiate Athletics: Swimming/Diving (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101O: Intercollegiate Athletics: Tennis (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101P: Intercollegiate Athletics: Track and Field (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101Q: Intercollegiate Athletics: Track and Field (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101R: Intercollegiate Athletics: Volleyball (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101S: Intercollegiate Athletics: Wrestling (men)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101T: Intercollegiate Athletics: Golf (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Head Coach*

Limited to a maximum of 4. Offered on a satisfactory-fail basis only. Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

**ATH 101U: Intercollegiate Athletics: Soccer (women)**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq:* Permission of head coach

Limited to a maximum of 4. Offered on a satisfactory-fail basis only.

Credit for a sport section of Ath 101 may not be applied toward graduation if credit is also received for KIN 166 or any skill technique course in the same sport.

## Biochemistry, Biophysics, and Molecular Biology (BBMB)

**Any experimental courses offered by BBMB can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**BBMB 101: Introduction to Biochemistry**

(1-0) Cr. 1. F.

Foundational principles of the molecules and chemistry of life, including structure and function of biological molecules: protein, lipids, nucleic acids, and carbohydrates. Survey of modern biotechnology frontiers. For students majoring in Biochemistry or Biophysics or considering one of these majors.

**BBMB 102: Introduction to Biochemistry Laboratory**

(0-2) Cr. 1. S.

*Prereq:* Credit or concurrent enrollment in (CHEM 177; CHEM 177L) or (CHEM 201; CHEM 201L)

Topics in the scientific background of biochemistry, such as macromolecules, metabolism, and catalysis. Laboratory experimentation covers biochemical concepts and the study of bio-molecules including proteins, lipids and nucleic acids. A significant component is practice in scientific communication. For students majoring in biochemistry, agricultural biochemistry or biophysics or considering one of these majors.

**BBMB 110: Biochemistry Learning Community Orientation**

Cr. 1. F.

Biochemistry & Biophysics Learning Community serving an overview of the program of study, academic planning, and university resources. Survey of careers and research in biotechnology and medicine. Introductions to ISU research and faculty. Concurrent enrollment with BBMB 101 highly recommended. Offered on a satisfactory-fail basis only.

**BBMB 111: Biochemistry Learning Community**

Cr. 1. S.

Biochemistry & Biophysics Learning Community serving an overview of career-development and research resources, including research opportunities, internships, lab skills, and leadership roles. Introductions to ISU research and faculty. Concurrent enrollment with BBMB 102 highly recommended. Offered on a satisfactory-fail basis only.

**BBMB 120: The Biochemistry of Beer**

(Cross-listed with FS HN). (2-0) Cr. 2. F.

An introduction to the major classes of biomolecules, basic biochemical concepts, enzymology, metabolism and genetic engineering as they apply to the production and flavor of beer. All aspects of the biochemistry of beer will be covered, including the malting of barley, starch conversion, yeast fermentation and the chemical changes that occur during the aging of beer. Intended for non-majors. Natural science majors are limited to elective credit only.

**BBMB 120L: Biochemistry of Beer Laboratory**

(Cross-listed with FS HN). Cr. 1.

*Prereq:* Credit or concurrent enrollment in BBMB 120

An introduction to biochemical methods related to the production of beer. Laboratory exercises related to water chemistry, mash enzymology, hop compound extraction and analysis, and yeast biology will be performed. Closely follows the material being taught in BBMB 120. Natural science majors are limited to elective credit only.

**BBMB 121: Medicines, Drugs and You**

Cr. 2. S.

An introduction to how medicines treat disease, what drug molecules look like, how they function, how they can be toxic, modern therapeutics ranging from over-the-counter pain relievers, antibiotics and anti-depressants, to anti-cancer chemotherapies. The differences between drugs and supplements. Intended for students of all majors.

**BBMB 201: Chemical Principles in Biological Systems**

(2-0) Cr. 2. S.

*Prereq:* Credit or concurrent enrollment in CHEM 332

Survey of chemical principles as they apply to biological systems including: water, organic chemistry of functional groups in biomolecules and biochemical cofactors, weak bonds and their contribution to biomolecular structure, oxidation-reduction reactions and redox potential, thermodynamic laws and bioenergetics, chemical equilibria and kinetics, inorganic chemistry in biological systems, data presentation. The subjects will be taught using molecules from biological systems as examples. Intended for majors in biochemistry, biophysics or agricultural biochemistry.

**BBMB 221: Structure and Reactions in Biochemical Processes**

(3-0) Cr. 3. F.S.

*Prereq: CHEM 163 or CHEM 167 or CHEM 177*

Fundamentals necessary for an understanding of biochemical processes. Primarily for students in agriculture. Not acceptable for credit toward a major in biochemistry, biophysics, or agricultural biochemistry. Credit for both BBMB 221 and Chem 231 may not be applied toward graduation.

**BBMB 301: Survey of Biochemistry**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 231 or CHEM 331*

A survey of biochemistry: structure and function of amino acids, proteins, carbohydrates, lipids, and nucleic acids; enzymology; metabolism; biosynthesis; and selected topics. Course offered online. Only one of BBMB 301, 303, or 316 may count toward graduation; Not acceptable for credit toward a major in biochemistry, biophysics, or agricultural biochemistry.

**BBMB 303: General Biochemistry**

Cr. 3. F.

*Prereq: CHEM 331*

Survey of biochemistry: structure and function of amino acids, proteins, carbohydrates, lipids and nucleic acids; enzyme activity; metabolism; DNA replication; RNA transcription; protein translation; with case studies examining industrial uses. Not acceptable for a credit towards a major in biochemistry, biophysics or agricultural biochemistry. Only one of 301, 303(X), or 316 may count toward graduation.

**BBMB 311: Writing Scientific Reports in Biochemistry**

Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BBMB 312*

Data analysis, presentation, and writing reports in biochemistry. This course accompanies BBMB 312.

**BBMB 312: Experimental Research Skills in Biochemistry**

Cr. 2. F.S.

*Prereq: BBMB 102; credit or concurrent enrollment in CHEM 178 or CHEM 201*

Inquiry-based introduction to biochemical techniques such as protein purification, enzymatic assays, solution preparation, hypothesis formation and testing, data analysis, high-throughput methodology, and research record keeping. Concurrent enrollment in BBMB 311 recommended.

**BBMB 316: Principles of Biochemistry**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 314; (CHEM 231 or CHEM 331)*

Biological systems at the molecular level; chemistry of biological macromolecules, enzyme function and regulation, basic metabolic pathways; integration of metabolism in diverse living systems. For students in biology and related majors who do not require the more rigorous treatment of biochemistry found in BBMB 404/405. Course offered online. Only one of BBMB 301, 303, or 316 may count toward graduation; Not acceptable for credit toward a major in biochemistry, biophysics, or agricultural biochemistry.

**BBMB 404: Biochemistry I**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 331*

A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical and nutritional sciences. First semester of a two-semester series with BBMB 405. Chemistry of amino acids, proteins, carbohydrates, and lipids, vitamins; protein structure and function; enzymology; carbohydrate metabolism. BIOL 314 strongly recommended. Credit for both BBMB 420 and the BBMB 404 - 405 sequence may not be applied toward graduation.

**BBMB 405: Biochemistry II**

(3-0) Cr. 3. F.S.SS.

*Prereq: BBMB 404*

A general overview for graduate and advanced undergraduate students in agricultural, biological, chemical, and nutritional sciences. Metabolism of carbohydrates, amino acids, nucleotides and lipids; formation, turnover, and molecular relationships among DNA, RNA, and proteins; genetic code; regulation of gene expression; selected topics in the molecular physiology of plants and animals. Course available online. Credit for both BBMB 420 and the BBMB 404 - BBMB 405 sequence may not be applied toward graduation.

**BBMB 410: Analysis of Scientific Literature**

(2-0) Cr. 2. Repeatable, maximum of 2 times. F.S.

*Prereq: Credit or concurrent enrollment in BBMB 404 or BBMB 504*

Examination and discussion of current research reports in biochemistry, biophysics, genetics, molecular and cell biology. Critical evaluation and analysis of scientific data and experimental design in research literature.

**BBMB 411: Techniques in Biochemical Research**

(2-8) Cr. 4. F.

*Prereq: Credit or concurrent enrollment in CHEM 332*

Laboratory experimentation and techniques for studying biochemistry, including: chromatographic methods; electrophoresis; spectrophotometry; enzyme purification; enzyme kinetics; and characterization of carbohydrates, proteins, lipids, and nucleic acids. Scientific communication and technical writing are emphasized.



**BBMB 420: Mammalian Biochemistry**

(3-0) Cr. 3. F.

*Prereq: BIOL 314; CHEM 332*

Structure and function of proteins; enzymology; biological oxidation; chemistry and metabolism of carbohydrates, lipids, amino acids and nucleic acids; protein synthesis and the genetic code; relationship of biochemistry to selected animal diseases. Biochemistry of higher animals emphasized. Not acceptable for credit toward a major in agricultural biochemistry or biochemistry. Acceptable for credit toward a major in biophysics. Credit for both BBMB 420 and the BBMB 404 - 405 sequence may not be applied toward graduation.

**BBMB 430: Prokaryotic Diversity and Ecology**

(Dual-listed with BBMB 530). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**BBMB 445: Molecular Signaling**

(Dual-listed with BBMB 545). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: 445: BBMB 405 or BBMB 420, 545: BBMB 506; BBMB 507*

Molecular mechanisms of cellular signaling including receptor activation, desensitization and cross talk, signal transduction pathways, nuclear receptors, growth factor and extracellular matrix activators, protein kinases, caspase and transcription factor downstream signals, and lipids, gases and cyclic nucleotides as regulators of cell signaling. Course content includes current literature, student and instructor presentations and, for BBMB 545 students only, research proposal writing and review.

**BBMB 461: Molecular Biophysics**

(Dual-listed with BBMB 561). (2-0) Cr. 2. S.

*Prereq: CHEM 178; PHYS 232*

Physical methods for the study of molecular structure and organization of biological materials. X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy. Registration for the graduate credit commits the student to graduate-level examinations, which differ from undergraduate-level examinations in the number and/or difficulty of questions.

**BBMB 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study with a faculty mentor. No more than 9 credits of BBMB 490 may count toward graduation.

**BBMB 490H: Independent Study, Honors**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study with a faculty mentor. No more than 9 credits of BBMB 490 may count toward graduation.

**BBMB 499: Undergraduate Research**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent research under faculty guidance.

**Courses primarily for graduate students, open to qualified undergraduates:**

**BBMB 504: Amino Acids and Proteins**

(2-0) Cr. 2. F.S.

*Prereq: CHEM 332 or equivalent*

Protein structure and chemistry including protein folding, examples of enzyme functions and mechanisms, methods of protein expression, purification, and analysis, and elementary enzyme kinetics.

**BBMB 505: Bioenergetics and Metabolism**

(2-0) Cr. 2. F.

*Prereq: CHEM 211, CHEM 332; a previous course in biochemistry is strongly recommended*

Examination of catabolic pathways involved in the oxidation of organic and inorganic molecules, and energy metabolism involving inputs from light or other non-light sources. Central metabolism and glycolysis, fermentation, aerobic and anaerobic respiration, photosynthesis.

**BBMB 506: Membrane Biochemistry**

(2-0) Cr. 2.

*Prereq: CHEM 332 or equivalent*

Analysis of the structure, function, and synthesis of membranes. Bacterial and eukaryotic membrane characteristics. Membrane transport and signaling mechanisms. Analysis of the structure and function of lipids and membrane proteins.

**BBMB 507: Biochemistry of Nucleic Acids**

(2-0) Cr. 2. S.

*Prereq: CHEM 332 or equivalent*

Analysis of the chemical structure, function, synthesis, and metabolism of nucleic acids. Chemical characterization of nucleotides, polynucleotides, DNA, and RNA. Analysis of transcription, translation, and the genetic code.

**BBMB 510: Molecular Biology and Biochemistry of RNA**

(2-0) Cr. 2. F.

*Prereq: BIOL 313, BBMB 405, BBMB 502, BBMB 506 and 507 or Gen 409, or equivalent*

Biochemical processes that define structure and function of nucleic acids. Emphasis on the molecular processes that take place during synthesis, processing, and function of different RNA species; review of recent advances in RNA research.

**BBMB 512: Principles of Glycobiology**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: 3 credits in Organic Chemistry*

Structure, synthesis, and functions of glycans, glycoproteins, glycolipids, and glycosylated secondary metabolites in prokaryotic and eukaryotic organisms. Fundamental role of glycans in living organisms along with the most advanced techniques used for their characterization. Biotechnological applications of glycans and glycoconjugates for human needs.

**BBMB 530: Prokaryotic Diversity and Ecology**

(Dual-listed with BBMB 430). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**BBMB 531: Plant Biochemistry**

(2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BBMB 301 or equivalent*

In-depth exploration of plant biochemistry with a focus on the unique aspects of plants versus heterotrophic organisms. Analysis of unique pathways, metabolic trafficking between unique organelles and tissues, and techniques for their characterization.

**BBMB 532: Enzyme Kinetics and Mechanisms**

Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BBMB 504*

Advanced concepts of enzyme kinetics and catalysis. Experimental methods for determining kinetic and chemical reaction mechanisms. Enzyme structure/function relationships and the role of dynamics in catalysis.

**BBMB 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**BBMB 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**BBMB 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**BBMB 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**BBMB 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**BBMB 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**BBMB 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**BBMB 545: Molecular Signaling**

(Dual-listed with BBMB 445). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq:* 445: BBMB 405 or BBMB 420, 545: BBMB 506; BBMB 507

Molecular mechanisms of cellular signaling including receptor activation, desensitization and cross talk, signal transduction pathways, nuclear receptors, growth factor and extracellular matrix activators, protein kinases, caspase and transcription factor downstream signals, and lipids, gases and cyclic nucleotides as regulators of cell signaling. Course content includes current literature, student and instructor presentations and, for BBMB 545 students only, research proposal writing and review.

**BBMB 549: Nuclear Magnetic Resonance Spectroscopy**

(Cross-listed with CHEM). (3-0) Cr. 3. S.

*Prereq:* any one of the following: CHEM 324, CHEM 325, BBMB 461, BBMB 561

Theoretical principles of NMR, practical aspects of experimental NMR, solution and solid state NMR, methodologies for molecule characterization, protein structure determination, NMR relaxation, and recent advances.

**BBMB 553: Current Research in Chemical and Physical Biology**

(2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq:* BBMB 404 or equivalent

Principles and applications of chemical and physical methods to analyze biological structures and function ranging from cells to individual biomolecules.

**BBMB 561: Molecular Biophysics**

(Dual-listed with BBMB 461). (2-0) Cr. 2. S.

*Prereq:* CHEM 178; PHYS 232

Physical methods for the study of molecular structure and organization of biological materials. X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy. Registration for the graduate credit commits the student to graduate-level examinations, which differ from undergraduate-level examinations in the number and/or difficulty of questions.

**BBMB 561L: Laboratory in Molecular Biophysics**

(1-3) Cr. 2. S.

*Prereq:* Credit or enrollment in BBMB 461/BBMB 561

Practice in methods of X-ray diffraction, nuclear magnetic resonance, hydrodynamics and fluorescence spectroscopy as applied to macromolecules.

**BBMB 569: Structural Bioinformatics**

(Cross-listed with BCB, COM S, CPR E, GDCB). (3-0) Cr. 3. F.

*Prereq:* BCB 567, BBMB 316, GEN 409, STAT 430

Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.

**BBMB 590: Special Topics**

Cr. arr.

By arrangement.

**BBMB 593: Workshop in Biochemistry and Biophysics**

Cr. 1. Repeatable. F.S.

*Prereq:* Permission and signature of course administrator required.

Workshops in selected topics in biochemistry and biophysics. Credit in this course does not meet the requirement for advanced graduate electives in Biochemistry. Spring only: BBMB Undergraduate Research Symposium participation. Scheduled class meetings are required in addition to attending the symposium.

**Courses for graduate students:****BBMB 615: Molecular Immunology**

(Cross-listed with MICRO, V MPM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* BBMB 405 or BBMB 506 and BBMB 507

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**BBMB 661: Advanced Topics in Neuroscience**

(Cross-listed with GDCB, KIN, NEURO). (3-0) Cr. 3. Repeatable. Alt. S., offered even-numbered years.

*Prereq:* NEURO 556 (or comparable course) or permission of instructor

Students will present three journal articles and two overview lectures on topics in neuroscience that are related but outside of their own research interest.

**BBMB 675: Nucleic Acid Structure and Function**

(2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

In-depth discussion of nucleic acid properties, structures and structure/function relationships. Interactions between nucleic acids and proteins will be emphasized.

**BBMB 681: Advanced Seminar**

Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor*

Student presentations.

**BBMB 682: Departmental Seminar**

Cr. R. F.S.

*Prereq: Permission of instructor*

Faculty, staff and invited guest research seminar.

**BBMB 696: Research Seminar**

(Cross-listed with AGRON, FOR, GDCB, HORT, PLBIO). Cr. 1. Repeatable.

Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**BBMB 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with GDCB, MCDB, MICRO, V MPM). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**BBMB 699: Research**

Cr. arr. Repeatable. F.S.

*Prereq: Permission of instructor*

## Bioinformatics and Computational Biology (BCB)

*Any experimental courses offered by BCB can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****BCB 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Permission of instructor*

**Courses primarily for graduate students, open to qualified undergraduates:**

**BCB 523: Mathematical Modeling in Biology**

(Cross-listed with MATH). (3-0) Cr. 3. F.

*Prereq: MATH 266 or MATH 267*

Introduction to mathematical techniques for modeling and simulation, parameter identification, and analysis of biological systems. Applications drawn from many branches of biology and medicine. Apply differential equations, difference equations, and dynamical systems theory to a wide array of biological problems. MATH 265 or equivalent recommended.

**BCB 544: Fundamentals of Bioinformatics**

(Cross-listed with COM S, CPR E, GDCB). (4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: MATH 165 or STAT 401 or equivalent*

A practical, hands-on overview of how to apply bioinformatics to biological research. Recommended for biologists desiring to gain computational molecular biology skills. Topics include: sequence analysis, genomics, proteomics, phylogenetic analyses, ontology enrichment, systems biology, data visualization and emergent technologies.

**BCB 546: Computational Skills for Biological Data**

(Cross-listed with EEOB). Cr. 3. F.

*Prereq: Graduate student status or permission of the instructor*

Computational skills necessary for biologists working with big data sets. UNIX commands, scripting in R and Python, version control using Git and GitHub, and use of high performance computing clusters. Combination of lectures and computational exercises.

**BCB 567: Bioinformatics Algorithms**

(Cross-listed with COM S, CPR E). (3-0) Cr. 3.

*Prereq: COM S 228; COM S 230; credit or enrollment in BIOL 315, STAT 430*

Biology as an information science. A review of the algorithmic principles that are driving the advances in bioinformatics and computational biology.

**BCB 568: Statistical Bioinformatics**

(Cross-listed with COM S, GDCB, STAT). (3-0) Cr. 3. S.

*Prereq: BCB 567 or (BIOL 315 and one of STAT 430 or STAT 483 or STAT 583), credit or enrollment in GEN 409*

Statistical models for sequence data, including applications in genome annotation, motif discovery, variant discovery, molecular phylogeny, gene expression analysis, and metagenomics. Statistical topics include model building, inference, hypothesis testing, and simple experimental design, including for big data/complex models.

**BCB 569: Structural Bioinformatics**

(Cross-listed with BBMB, COM S, CPR E, GDCB). (3-0) Cr. 3. F.

*Prereq: BCB 567, BBMB 316, GEN 409, STAT 430*

Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.

**BCB 570: Systems Biology**

(Cross-listed with COM S, CPR E, GDCB, STAT). (3-0) Cr. 3. S.

*Prereq: BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430 or STAT 483 or STAT 583*

Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

**BCB 585: Fundamentals of Predictive Plant Phenomics**

(Cross-listed with GDCB, M E). Cr. 4. F.

Principles of engineering, data analysis, and plant sciences and their interplay applied to predictive plant phenomics. Transport phenomena, sensor design, image analysis, graph models, network data analysis, fundamentals of genomics and phenomics. Multidisciplinary laboratory exercises.

**BCB 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***BCB 593: Workshop in Bioinformatics and Computational Biology**

(1-0) Cr. 1. Repeatable. F.S.

Current topics in bioinformatics and computational biology research. Lectures by off-campus experts. Students read background literature, attend preparatory seminars, attend all lectures, meet with lecturers.

**BCB 598: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of the program chair*

Off-campus work periods for graduate students in the field of bioinformatics and computational biology.

**BCB 599: Creative Component**

Cr. arr.

**Courses for graduate students:****BCB 660: Selected Topics in Bioinformatics and Computational Biology**

(3-0) Cr. 1-4. Repeatable, maximum of 4 times. F.S.SS.

*Prereq: Permission of Instructor*

Topics of interest in the major research areas of computational molecular biology, including genomics, structural genomics, functional genomics, and computational systems biology.

**BCB 690: Student Seminar in Bioinformatics and Computational Biology**

Cr. 1. Repeatable. S.

Student research presentations.

**BCB 691: Faculty Seminar in Bioinformatics and Computational Biology**

(1-0) Cr. 1. Repeatable.

Faculty research series.

**BCB 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with AGRON, E E, ENGR, GENET, M E). (3-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq: Graduate student status and completion of at least one semester of graduate coursework.*

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**BCB 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.SS.

Graduate research projects performed under the supervision of selected faculty members in the Bioinformatics and Computational Biology major.

**BCB 699: Research**

Cr. arr. Repeatable.

## Bioinformatics and Computational Biology (BCBIO)

*Any experimental courses offered by BCBIO can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**BCBIO 110: BCBIO Orientation**

(1-0) Cr. 0.5. F.

First 8 weeks. Orientation to the area of bioinformatics and computational biology. For students considering a major in BCBIO. Specializations and career opportunities. Offered on a satisfactory-fail basis only.

**BCBIO 322: Introduction to Bioinformatics and Computational Biology**

(Cross-listed with BIOL, GEN). (3-0) Cr. 3. F.

*Prereq: BIOL 212*

Genome sequencing, assembly, structural and functional annotation, and comparative genomics. Investigating these topics will develop skills in programming and scripting (Perl and/or Python), the use of biological databases, sequence alignment, similarity search, identification of sequence patterns, construction of phylogenetic trees, and comparative genomics.

**BCBIO 401: Bioinformatics of Sequences**

(Cross-listed with BIOL, COM S, GEN). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: (BCBIO 322; [COM S 127 or COM S 227]; [MATH 160 or MATH 165]; [MATH 166 or STAT 301]; [STAT 101 or STAT 104 or STAT 330]) or Permission of Instructor*

Application of computer science and statistics to molecular biology with a significant problem-solving component, including hands-on programming using Python to solve a variety of biological problems. String algorithms, sequence alignments, homology search, pattern discovery, genotyping, genome assembly, genome annotation, comparative genomics, protein structure.

**BCBIO 406: Bioinformatics of OMICS**

(Cross-listed with BIOL, COM S, GEN). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Introduction to cutting edge OMICS analyses including transcriptome, proteome, metabolome, DNA-protein interactome, protein-protein interactome and methylome. Genomic analysis including transcriptome analysis, cancer genomics, comparative genomics, and regulatory network analysis.

**BCBIO 423: Mathematical Modeling in Biology**

(Dual-listed with BCBIO 423). (Cross-listed with MATH). (3-0) Cr. 3. F.

*Prereq: MATH 266 or MATH 267*

Introduction to mathematical techniques for modeling and simulation, parameter identification, and analysis of biological systems. Applications drawn from many branches of biology and medicine. Apply differential equations, difference equations, and dynamical systems theory to a wide array of biological problems. MATH 265 or equivalent recommended.

**BCBIO 442: Bioinformatics and Computational Biology Techniques**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. BIOL 314 recommended. Offered on a satisfactory-fail basis only.

**BCBIO 442A: Bioinformatics and Computational Biology Techniques: Sequence Database Searching**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. BIOL 314 recommended. Offered on a satisfactory-fail basis only.

**BCBIO 442B: Bioinformatics and Computational Biology: Protein Structure Databases, Visualization, and Prediction**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. BIOL 314 recommended. Offered on a satisfactory-fail basis only.

**BCBIO 442C: Bioinformatics and Computational Biology Techniques: Phylogenetic Analysis**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. BIOL 314 recommended. Offered on a satisfactory-fail basis only.

**BCBIO 442D: Bioinformatics and Computational Biology Techniques: Microarray Analysis**

(0.2-0.5) Cr. 0.5. Repeatable, maximum of 2 credits. S.SS.

Modular minicourses consisting of guided tutorials and hands-on computer software exercises focused on fundamental problems, approaches, and software applications in bioinformatics and computational biology. BIOL 314 recommended. Offered on a satisfactory-fail basis only.



**BCBIO 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: BCBIO 322; Junior or Senior classification; Permission of Instructor*  
Independent research projects for undergraduate students in bioinformatics and computational biology. Students in the College of Liberal Arts and Sciences may use no more than 9 credits of BCBIO 490 and 491 toward graduation.

**BCBIO 491: Team Research Projects**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: BCBIO 322; Junior or Senior classification; Permission of Instructor*  
Research projects in bioinformatics and computational biology done by teams of students. Students in the College of Liberal Arts and Sciences may use no more than 9 credits of BCBIO 490 and 491 toward graduation.

## Biological/Pre-Medical Illustration (BPM I)

**Any experimental courses offered by BPM I can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**BPM I 323: Scientific Illustration Principles and Techniques**

(Cross-listed with ARTIS). (0-6) Cr. 3. Repeatable.

*Prereq: DSN S 131, ARTIS 230, or equivalent, and 3 credits in biological sciences; or permission of the instructor*

Studio basics and professional techniques in black & white, continuous tone, and color. Introduction to professional practice and principles of communicating science through art. Emphasis on tools, materials, and rendering.

**BPM I 326: Illustration and Illustration Software**

(Cross-listed with ARTIS). (0-6) Cr. 3. Repeatable.

*Prereq: ARTIS 323 or BPM I 323 or Permission of Instructor*

An introduction to digital illustration software. Application of painting, drawing and image making techniques using vector and raster based programs.

**BPM I 327: Illustration as Communication**

(Cross-listed with ARTIS). (0-6) Cr. 3.

*Prereq: ARTIS 326 or BPM I 326 or Permission of Instructor*

Investigation of illustration as a form of communication. Emphasis on problem solving, effective composition, and advancement of rendering skills.

**BPM I 337: Application of Scientific Illustration Techniques**

(Cross-listed with ARTIS). (0-6) Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq: ARTIS 327*

Rendering techniques applied to different types of biological and scientific subjects emphasizing communication. The use of traditional and digital media. Term project required.

**BPM I 395: Field Illustration**

Cr. 1-3. Repeatable, maximum of 6 credits. S.SS.

*Prereq: ARTIS 230 or Permission of Instructor*

A combination seminar and field trip course emphasizing nature interpretation, field sketching techniques and preparation of a final illustration based on field experience.

**BPM I 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Junior classification; Permission of Instructor*

Required of all cooperative education students. Students must register for these courses prior to commencing each work period.

**BPM I 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: Permission of Instructor*

**BPM I 491: Portfolio Design and Professional Development**

Cr. 2. S.

*Prereq: (BPM I 337; Junior or Senior classification) or Permission of Instructor*

Portfolio and professional preparation including identity package development, writing and speaking. Career-readiness, professional practice, leadership, networking, exploring research subfields within scientific visualization. Creating print and digital visual materials, learning approaches for entering the field, and developing business practice skills. Final portfolio materials presented at the end of the term.

**BPM I 494: Special Topics in Illustration**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive exploration of illustration techniques in a studio or field setting.

**BPM I 497: Illustration Internship**

Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: BPM I major; Junior or Senior classification; Permission of Instructor*

Offered on a satisfactory-fail basis only.

## Biology (BIOL)

**Any experimental courses offered by BIOL can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****BIOL 101: Introductory Biology**

(3-0) Cr. 3. F.S.SS.

Life considered at cellular, organism, and population levels. Function and diversity of the living world. Presentation of basic biological principles as well as topics and issues of current human interest. Does not satisfy biology major requirements.

**BIOL 110: Biology Major Orientation**

Cr. 1. F.

Student orientation to the Biology program. Introduction to degree requirements, university policies and deadlines, campus resources, academic success strategies, degree planning, and registration procedures. Community building through the Biology Education Success Teams Learning Community. Required for first-year direct from high school Biology majors. Offered on a satisfactory-fail basis only.

**BIOL 111: Opportunities in Biology**

(1-0) Cr. 0.5. S.

*Prereq: Direct-from-high school students only*

Orientation to opportunities in Biology. Introduction to biological science disciplines, career awareness, and professional development opportunities. Required for first-year direct from high school Biology majors. Offered on a satisfactory-fail basis only.

**BIOL 112: Transfer Student Orientation**

Cr. 1. F.S.

*Prereq: Serves: Internal and external transfer students (emphasis on external transfers)*

Orientation to the Biology major for students transferring from other academic institutions. Reviews university resources, academic success strategies, degree requirements, opportunities for campus involvement, and professional development. Required for all new transfer students and recommended for major changes. Online with on-campus activities. Offered on a satisfactory-fail basis only.

**BIOL 155: Human Biology**

(3-0) Cr. 3. F.S.

A survey course of human biology, including principal structures and functions of the body systems and the diseases and disorders associated with them. Designed to meet general education requirements in natural science. Not recommended for those seeking a career in the allied health professions or for students majoring in life science. Does not satisfy biology major requirements.

**BIOL 173: Environmental Biology**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment. Discussions of human population growth, biodiversity, sustainability, resource use, and pollution. Does not satisfy biology major requirements.

**BIOL 201: Introduction to Environmental Issues**

(Cross-listed with ENSCI, ENV S). (2-0) Cr. 2. F.

Discussion of current and emerging environmental issues such as human population growth, energy use, loss of biodiversity, water resources, and climate change.

**BIOL 204: Biodiversity**

(Cross-listed with ENV S). (4-0) Cr. 2. S.

*Prereq: One course in life sciences*

Survey of the major groups of organisms and biological systems. Definition, measurements, and patterns of distribution of organisms. Sources of information about biodiversity. Does not satisfy biology major requirements. Half semester course. See list of life science courses (<https://www.cals.iastate.edu/student-services/lifescience>) for additional information.

**BIOL 211: Principles of Biology I**

(3-0) Cr. 3. F.S.

*Prereq: High school biology*

Introduction to the nature of life, including the diversity of microbial, plant, and animal life; the nature of heredity; evolution; and principles of ecology. Intended for life science majors.

**BIOL 211L: Principles of Biology Laboratory I**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 211*

Laboratory to accompany 211.

**BIOL 212: Principles of Biology II**

(3-0) Cr. 3. F.S.

*Prereq: High School Biology; High School Chemistry or credit or enrollment in CHEM 163 or CHEM 177*

Introduction to the chemical, molecular, and cellular basis of life; form and function of microbial, plant, and animal life. Intended for life science majors. HS courses in biology and chemistry necessary. Credit or enrollment in CHEM 163 or CHEM 177 recommended.

**BIOL 212L: Principles of Biology Laboratory II**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 212*

Laboratory to accompany 212.

**BIOL 251: Biological Processes in the Environment**

(Cross-listed with ENSCI). (3-0) Cr. 3. S.

Principles of Biology from the level of macromolecules to the biosphere. Biological processes that affect environmental systems: including metabolism, energy pathways, biochemical reactions in cells, plant and microbial structure and function, element and water cycles.

**BIOL 255: Fundamentals of Human Anatomy**

(3-0) Cr. 3. F.

*Prereq: High School Biology and Chemistry or BIOL 101*

An introduction to human anatomy, beginning with cells and tissues, surveying all body systems, relating form to function. Systems covered include: integumentary, bones and joints, muscles, nervous, sensory, endocrine, circulatory, lymphatic, respiratory, digestive, urinary, and reproductive. Pre-Medical students should consider BIOL 351 for their anatomy background. Does not satisfy biology major requirements. HS courses in biology and chemistry necessary. Credit or enrollment in BIOL 101 recommended.

**BIOL 255L: Fundamentals of Human Anatomy Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in BIOL 255*

Investigation of human anatomy using models and dissections of preserved organs and model mammals. Pre-Medical students should consider 351 for their anatomy background. Does not satisfy biology major requirements.

**BIOL 256: Fundamentals of Human Physiology**

(3-0) Cr. 3. S.

*Prereq: High School Biology and Chemistry*

An introduction to human physiology, studying the function of all body systems. Systems covered include: integumentary, bones and joints, muscles, nervous, sensory, endocrine, circulatory, lymphatic and immune, respiratory, digestive, urinary, and reproductive. Does not satisfy biology major requirements. HS courses in biology and chemistry necessary. Credit or enrollment in BIOL 101 or BIOL 255 recommended.

**BIOL 256L: Fundamentals of Human Physiology Laboratory**

(0-3) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in BIOL 256*

Student-conducted experiments investigating concepts of human physiology with computer data acquisition and analysis. Interpretation of experimental results and preparation of lab reports. Does not satisfy biology major requirements.

**BIOL 307: Women in Science and Engineering**

(Cross-listed with WGS, WISE). (3-0) Cr. 3. F.

*Prereq: 200 level course in science, engineering or women's studies; ENGL 250*

The interrelationships of women and science and engineering examined from historical, sociological, philosophical, and biological perspectives. Factors contributing to under-representation; feminist critiques of science; examination of successful strategies. Does not satisfy biology major advanced credit requirements.

**BIOL 312: Ecology**

(Cross-listed with A ECL, ENSCI). (3-3) Cr. 4. F.SS.

*Prereq: BIOL 211; (BIOL 212 or BIOL 251)*

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats.

**BIOL 313: Principles of Genetics**

(Cross-listed with GEN). (3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Introduction to the principles of transmission and molecular genetics of plants, animals, and bacteria. Recombination, structure and replication of DNA, gene expression, cloning, quantitative genetics, and population genetics. Students may receive graduation credit for no more than one of the following: Gen 260, Gen 313 and 313L, Gen 320, Biol 313 and 313L, and Agron 320.

**BIOL 313L: Genetics Laboratory**

(Cross-listed with GEN). (0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 313*

Laboratory to accompany 313. Students may receive graduation credit for no more than one of the following: Biol 313 and 313L, Gen 260, Gen 313, Gen 320, and Agron 320.

**BIOL 314: Principles of Molecular Cell Biology**

(3-0) Cr. 3. F.S.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Integration of elementary principles of metabolism, bioenergetics, cell structure, and cell function to develop a molecular view of how the cell works.

**BIOL 315: Biological Evolution**

(3-0) Cr. 3. F.S.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

The mechanisms of evolution. Topics in microevolution: population genetics, natural selection, genetic variation, and adaptation. Macroevolution: speciation, extinction, phylogeny, and major evolutionary patterns.

**BIOL 318: Introduction to Ecosystems**

(Cross-listed with AGRON, ENSCI, NREM). (3-0) Cr. 3. S.

*Prereq:* 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**BIOL 319: Analysis of Environmental Systems**

(Cross-listed with ENSCI, ENV S). Cr. 3. S.

*Prereq:* ENSCI 312; Junior classification

Systems approach to the analysis and modeling of material and energy flows in natural and managed environmental systems and the primary environmental factors controlling these systems. Applications in hydrology, biogeochemistry, and population dynamics.

**BIOL 322: Introduction to Bioinformatics and Computational Biology**

(Cross-listed with BCBIO, GEN). (3-0) Cr. 3. F.

*Prereq:* BIOL 212

Genome sequencing, assembly, structural and functional annotation, and comparative genomics. Investigating these topics will develop skills in programming and scripting (Perl and/or Python), the use of biological databases, sequence alignment, similarity search, identification of sequence patterns, construction of phylogenetic trees, and comparative genomics.

**BIOL 328: Molecular and Cellular Biology of Human Diseases**

Cr. 3. F.

*Prereq:* BIOL 212

Survey of molecular, genetic, and cellular aspects of human diseases. Fundamental concepts of cell biology and how they are linked to the pathologies of different classes of human diseases. Recent scientific advances with an emphasis on new methods of diagnosis and treatment.

**BIOL 335: Principles of Human and Other Animal Physiology**

(3-0) Cr. 3. S.

*Prereq:* BIOL 211, BIOL 212

Introduction to physiology of metabolic function in mammals and other animals. Metabolic processes and their interactions with various subsystems, approached from an organismal perspective. Integration of cellular, gastrointestinal, cardiovascular, respiratory, and renal processes, relevant to their control and integration at the nervous and endocrine system levels. Functional aspects of organismal physiology, energy and water balances, physiology of rest exercise, and environmental stress.

**BIOL 335L: Principles of Human and Other Animal Physiology Laboratory**

(0-3) Cr. 1. S.

Optional laboratory to accompany Biology 335. Student-conducted experiments investigating concepts of physiology.

**BIOL 336: Ecological and Evolutionary Animal Physiology**

Cr. 3.

*Prereq:* BIOL 211, BIOL 212

Study of mechanisms by which animals perform life-sustaining functions; the evolution and adaptive significance of physiology traits, the diversity of physiological mechanisms, and how physiology and ecology interact.

**BIOL 344: Human Reproduction**

(Cross-listed with WGS). (3-0) Cr. 3. S.

*Prereq:* BIOL 212

Biology of human reproduction, including reproductive systems, hormones, and endocrinology of pregnancy, presented from a clinically-oriented perspective. Reviews health-related conditions such as infertility, sexually-transmitted diseases, and complicated pregnancy.

**BIOL 349: The Genome Perspective in Biology**

(Cross-listed with GEN). (3-2) Cr. 4. S.

*Prereq:* GEN 313 or GEN 320

Analysis of genome, RNA, and protein data using computer technology to answer biological questions on topics ranging from microbial diversity to human health. An introduction for students in the life sciences to the fields of genomics, bioinformatics and systems.

**BIOL 350: Comprehensive Human Anatomy**

(3-3) Cr. 4. F.

*Prereq:* BIOL 212

Comprehensive survey of human anatomy, emphasizing structural and functional relationships of major organ systems. Compartmental study of normal anatomy; practical clinical application of anatomical regions. Laboratory using 3-dimensional software to study anatomy in augmented reality. Recommended for pre-medical and pre-health professional students.

**BIOL 351: Comparative Chordate Anatomy**

(3-4) Cr. 5. S.

*Prereq:* BIOL 212; Junior classification

The evolution of chordates as reflected in the anatomy of extinct and living forms. Lecture topics include the history and diversity of chordates, comparisons of anatomic structures among major groups, and the adaptive significance of anatomic structures. Laboratory involves dissection of representative species.

**BIOL 352: Vertebrate Histology**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq:* BIOL 212

Microanatomy of animal cells, tissues, and organs; histology from a functional perspective; ultra-structure of cells, the four primary tissues, and different anatomical organs, focusing on function and clinical significance.

**BIOL 353: Introductory Parasitology**

(Cross-listed with MICRO, V PTH). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**BIOL 354: Animal Behavior**

(3-0) Cr. 3. F.

*Prereq: BIOL 212*

Ethological and sociobiological approaches to animal behavior. Genetic and developmental aspects of behavior, biological rhythms, orientation (including navigation, migration), communication, and social behavior (mating, aggression, parental care).

**BIOL 354L: Laboratory in Animal Behavior**

(0-3) Cr. 1. F.

*Prereq: Credit or enrollment in BIOL 354*

Laboratory techniques for observation, description and analysis of animal activities; independent projects.

**BIOL 355: Plants and People**

(3-0) Cr. 3. S.

*Prereq: Credit in BIOL 211 and BIOL 211L*

Uses of plants and fungi by humans and the importance of plants in the past, present, and future. Discussion of fruits, vegetables, grains, herbs, spices, beverages, oils, fibers, wood, medicines, and drugs, in the context of their agricultural, cultural, and economic roles in modern societies. Emphasis on origins and worldwide diversity of culturally important plants, their characteristics, and uses.

**BIOL 356: Dendrology**

(Cross-listed with FOR). (2-2) Cr. 3. F.

*Prereq: BIOL 211*

Identification and ecology of North American woody plant species. Importance of woody plants in timber production and wildlife habitat. Historical conditions of North American forest regions will also be addressed.

**BIOL 357: Biology of Plants**

Cr. 3. F.

*Prereq: BIOL 211; BIOL 212*

Study of the general biology of plants, including plant cells and functions, basic anatomy of tissues, meristems, and organs; adaptive morphological features. Review of processes of photosynthesis, respiration, basic plant metabolic functions, and plant reproduction. Survey of evolutionary aspects of all major groups of land plants, and relationships of plants to their environment. Intended for Biology and other life science undergraduate majors. BIOL 211L and BIOL 212L recommended.

**BIOL 358: Bee Biology, Management, and Beekeeping**

(Cross-listed with ENT). (3-0) Cr. 3. F.

*Prereq: 1 course in 200-level BIOL or Permission of Instructor*

Bee diversity and evolution, ecology, role as pollinators, behavior, anatomy, and development. Management of bees as agricultural pollinators and honey producers, focusing on honey bees. Working with live bee hives and demonstration of practical beekeeping skills will occur during several field trips to local hives.

**BIOL 364: Invertebrate Biology**

Cr. 3-4. F.

*Prereq: BIOL 211; BIOL 212*

Emphasis on diversity, development, physiology, and behavior of invertebrate organisms- the "spineless wonders" of the world. Laboratory involves hands-on study and investigation of living invertebrates.

**BIOL 365: Vertebrate Biology**

(Cross-listed with A ECL). (3-2) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L*

Evolution, biology, and classification of fish, amphibians, reptiles, birds, and mammals. Emphasis on a comparative analysis of the structure and function of organ systems. Laboratory exercises concentrate on morphology and identification of orders of vertebrates.

**BIOL 366: Plant Systematics**

(2-4) Cr. 4. S.

*Prereq: BIOL 211*

Introduction to plant phylogenetic systematics, plant classification, survey of flowering plant families, and identification and field study of local plants.

**BIOL 370: GIS for Ecology and Environmental Science**

(Cross-listed with ENSCI). Cr. 1-6. Repeatable. F.S.

*Prereq: Six credits in biological and /or physical sciences, and permission of instructor.*

Introduction to geographic information systems (GIS) with emphasis on ecological and environmental applications. No prior GIS experience required. Guided, individualized study of topics based on student background and interest. For students with prior experience, topics and activities are selected to build upon any previous experience and minimize duplication to previous GIS coursework. Potential topics include: basic concepts of GIS, data structures, database management, spatial analysis, modeling and visualization of ecological and environmental data. Case studies in ecological and environmental applications using ArcGIS. Offered on a satisfactory-fail basis only.

**BIOL 371: Ecological Methods**

(Cross-listed with A ECL). (2-3) Cr. 3. F.

*Prereq: A ECL 312; (STAT 101 or STAT 104)*

Quantitative techniques used in management of natural resources with emphasis on inventory and manipulation of habitat and animal populations.

**BIOL 375: Marine Ecology and Ecosystems Dynamics**

(Cross-listed with A ECL, ENSCI). (3-0) Cr. 3. S.

*Prereq: BIOL 211*

Overview of the ecological processes, ecosystems, and biodiversity in marine environments. Ever-changing dynamics caused by environmental disturbances, internal forces, or by human impacts on species and ecosystems.

**BIOL 393: North American Field Trips in Biology**

Cr. 1-4. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Extended field trips, usually during break periods, to North American locations of interest to biologists. Inquire in the Biology Program Office, 103 Bessey Hall, for trip schedule.

**BIOL 393A: North American Field Trips in Biology: Pre-trip Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Discussion of relevant biological and cultural topics during semester preceding extended field trips to North American locations of interest to biologists.

**BIOL 393B: North American Field Trips in Biology: North American Field trip**

Cr. 1-3. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Extended field trip under supervision of faculty member, usually during break periods, to North American locations of interest to biologists. Inquire in the Biology Program Office, 103 Bessey Hall, for trip schedule. Report required.

**BIOL 394: International Field Trips in Biology**

Cr. 1-4. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Extended field trips, usually during break periods, to international locations of interest to biologists. Inquire in the Biology Program Office, 103 Bessey Hall, for trip schedule.

Meets International Perspectives Requirement.

**BIOL 394A: International Field Trips in Biology: Pre-trip Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Discussion of relevant biological and cultural topics during semester preceding extended field trip to international locations of interest to biologists.

Meets International Perspectives Requirement.

**BIOL 394B: International Field Trips in Biology: Field Trip to International Location**

Cr. 1-3. Repeatable.

*Prereq: Two courses in the biological sciences and by approval of application*

Extended field trips, under supervision of faculty member, usually during break periods, to international locations of interest to biologists. Inquire in the Biology Program Office, 103 Bessey Hall, for trip schedule.

Meets International Perspectives Requirement.

**BIOL 401: Bioinformatics of Sequences**

(Cross-listed with BCBIO, COM S, GEN). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: (BCBIO 322; [COM S 127 or COM S 227]; [MATH 160 or MATH 165]; [MATH 166 or STAT 301]; [STAT 101 or STAT 104 or STAT 330]) or Permission of Instructor*

Application of computer science and statistics to molecular biology with a significant problem-solving component, including hands-on programming using Python to solve a variety of biological problems. String algorithms, sequence alignments, homology search, pattern discovery, genotyping, genome assembly, genome annotation, comparative genomics, protein structure.

**BIOL 402: Introduction to Pathology**

(Cross-listed with V PTH). (3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Introductory exploration of pathology as a medical discipline. This includes study of disease mechanisms via an introduction to general pathology topics (cell degeneration, necrosis, disturbances of growth, disturbances of blood flow, inflammation, neoplasia) and organ system-specific response to injury.

**BIOL 406: Bioinformatics of OMICS**

(Cross-listed with BCBIO, COM S, GEN). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Introduction to cutting edge OMICS analyses including transcriptome, proteome, metabolome, DNA-protein interactome, protein-protein interactome and methylome. Genomic analysis including transcriptome analysis, cancer genomics, comparative genomics, and regulatory network analysis.



**BIOL 414: Life History and Reproductive Strategies**

(Dual-listed with EEOB 514). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Evolution of ecological adaptations at the individual, population, and species level. Emphasis is on evolutionary mechanisms and adaptive strategies related to life histories and reproduction; age and size at maturity; lifespan and senescence; offspring size/number trade-offs; sex and mating systems; sex determination and sex ratios. BIOL 315 or equivalent recommended.

**BIOL 421: Biological Principles of Aging**

(Dual-listed with EEOB 521). (3-0) Cr. 3. SS.

*Prereq: BIOL 211 and BIOL 212*

Basic biological principles of aging. Course modules include an introduction to the aging process, body systems and normal aging, and environment and the biology of aging. In addition, disorders and diseases of aging, prevention and treatment and exercise and aging topics will be covered.

**BIOL 423: Developmental Biology**

(3-0) Cr. 3. S.

*Prereq: BIOL 313*

Principles of embryogenesis and animal development. Establishment of body axes, organ and limb development, and specification of cell fates. Emphasis on cell signaling and the control of gene expression within the context of a developing organism. Medically relevant subjects will be discussed, including stem cells, cancer biology, fertilization, and cloning.

**BIOL 423L: Developmental Biology Laboratory**

(0-3) Cr. 1. Repeatable, maximum of 4 times. S.

*Prereq: (Credit or concurrent enrollment in BIOL 423) or Permission of Instructor*

Experiments and explorations illustrating fundamental principles of multicellular development.

**BIOL 428: Cell Biology**

(3-0) Cr. 3. S.

*Prereq: BIOL 314*

Cell structure and function in health and disease. Emphasis on cellular dynamics, transport, organelle biogenesis and signaling, and how defects in these processes disrupt cell function.

**BIOL 430: Principles of Plant Physiology**

(3-0) Cr. 3. S.

*Prereq: BIOL 212; (CHEM 231 or CHEM 332)*

An overview of classical and current concepts, principles, and approaches regarding the basic mechanisms of plant function underlying growth, development, and survival of plants. Topics covered include environmental and developmental signals, plant hormone action, signal transduction, mineral nutrition, water relations, metabolism, and photosynthesis.

**BIOL 434: Endocrinology**

(Dual-listed with EEOB 534). (3-0) Cr. 3. S.

*Prereq: BIOL 211; BIOL 212*

Chemical integration of vertebrate organisms. The structure, development, and evolution of the endocrine glands and the function and structure of their hormones.

**BIOL 436: Neurobiology**

(3-0) Cr. 3. F.

*Prereq: BIOL 212*

Basic principles of brain function and development. Signaling of nerve cells, synaptic transmission, structure/function of ion channels and receptors, memory and synaptic plasticity, movement and central control, sensation and sensory processing, construction of neural circuits, early brain development, complex brain functions in health and disease.

**BIOL 451: Plant Evolution and Phylogeny**

(Dual-listed with EEOB 551). (3-3) Cr. 4. Alt. F., offered even-numbered years.

*Prereq: BIOL 315 or equivalent.*

Survey of land plant evolution; phylogenetic comparison of anatomical, reproductive, and life history specializations. Relationships among bryophytes, lycophytes, pteridophytes, gymnosperms, and angiosperms emphasizing significant evolutionary changes documented by paleobotanical, morphological, and molecular studies.

**BIOL 454: Plant Anatomy**

(3-3) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: BIOL 212L*

Characteristics of cell and tissue types in vascular plants. Anatomy of developing and mature stems, roots, and leaves, including secondary (woody) growth. Introduction to the special anatomy of flowers and seeds. BIOL 366 recommended.

**BIOL 455: Bryophyte and Lichen Biodiversity**

(Dual-listed with EEOB 555). (2-3) Cr. 3. S.

*Prereq: BIOL 211; BIOL 211L*

Introduction to the biology and ecology of mosses, liverworts, and lichens. Emphasis on identification and diversity of local representatives of these three groups of organisms. Required field trips and service-learning.

**BIOL 456: Principles of Mycology**

(Cross-listed with MICRO). (2-3) Cr. 3. F.

*Prereq: 10 credits in BIOL or MICRO*

Morphology, diversity, and ecology of fungi; their relation to agriculture, industry, and human health.

**BIOL 457: Herpetology**

(Cross-listed with A ECL). (2-0) Cr. 2. F.

*Prereq: BIOL 351 or BIOL 365*

Biology, ecology, and evolution of amphibians (salamanders, frogs, caecilians) and reptiles (lizards, snakes, tuatara, turtles, crocodilians). Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of amphibians and reptiles in ecosystems, and conservation. Laboratory focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**BIOL 457L: Herpetology Laboratory**

(Cross-listed with A ECL). (0-3) Cr. 1. F.

*Prereq: BIOL 351 or BIOL 365 or A ECL 365; Concurrent enrollment in BIOL 457 or A ECL 457*

Laboratory to accompany Biology/Animal Ecology 457. Focus on survey methods, identification, relationships, distribution, habits, and habitats of amphibians and reptiles.

**BIOL 458: Ornithology**

(Cross-listed with A ECL). (2-0) Cr. 2. S.

*Prereq: A ECL 365 or BIOL 351*

Biology, evolution, ecology and taxonomy of birds. Emphasis on structure, physiology, behavior, communication, navigation, reproduction, and conservation.

**BIOL 458L: Ornithology Laboratory**

(Cross-listed with A ECL). (0-3) Cr. 1. S.

*Prereq: (A ECL 365 or BIOL 351); concurrent enrollment in A ECL 458 or BIOL 458*

Laboratory complements lecture topics with emphasis on external anatomy, identification and distribution of Midwest birds, and field trips.

**BIOL 459: Mammalogy**

(Cross-listed with A ECL). (2-0) Cr. 2. S.

*Prereq: A ECL 365 or BIOL 351*

Biology, ecology, and evolution of mammals. Emphasis on structure, physiological adaptation to different environments, behavior, reproduction, roles of mammals in ecosystems, and conservation.

**BIOL 459L: Mammalogy Laboratory**

(Cross-listed with A ECL). (0-3) Cr. 1. S.

*Prereq: (A ECL 365 or BIOL 351); concurrent enrollment in (A ECL 459 or BIOL 459)*

Laboratory focus on identification, survey methods, distribution, habits, and habitats of mammals. Several field trips.

**BIOL 462: Evolutionary Genetics**

(Cross-listed with GEN). (3-0) Cr. 3. F.

*Prereq: BIOL 315*

The population and quantitative genetic basis of evolutionary processes. The role of genetic variation in natural selection and the influences of random processes on evolutionary change. The determinants of phenotype.

**BIOL 464: Wetland Ecology**

(Dual-listed with EEOB 564). (Cross-listed with ENSCI). (3-0) Cr. 3. S.

*Prereq: 15 credits in biological sciences.*

Ecology, classification, creation and restoration, and management of wetlands. Emphasis on North American temperate wetlands.

**BIOL 465: Macroevolution**

(Dual-listed with EEOB 565). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 315*

The history and diversity of life on earth; evolutionary patterns and processes above the species level. Diversity from a phylogenetic perspective. Empirical exercises include: phylogeny estimation, ancestral states, estimating diversification rates, evaluating the tempo and mode of evolution, biogeographic patterns, and trait associations across the tree of life.

**BIOL 471: Introductory Conservation Biology**

(Cross-listed with A ECL). Cr. 3. S.

*Prereq: BIOL 312*

Examination of conservation issues from a population and community perspective. The role of genetics, demography, and environment in determining population viability, habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**BIOL 474: Plant Ecology**

(3-0) Cr. 3. S.

*Prereq: BIOL 312*

Principles of plant population and community ecology.

**BIOL 476: Functional Ecology**

(Dual-listed with EEOB 576). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

The nature of adaptations to physical and biotic environments. Biophysical, biomechanical, and physiological bases of the structure, form, growth, distribution, and abundance of organisms.

**BIOL 480: Studies in Marine Biology**

Cr. 1-8. Repeatable.

Courses taken at Gulf Coast Research Laboratory and other marine biological stations are transferred to Iowa State University under this number.

**BIOL 481: Summer Field Studies**

Cr. 1-8. Repeatable.

Courses taken at summer biological field stations are transferred to Iowa State University under this number. See [www.biology.iastate.edu](http://www.biology.iastate.edu) for links to field stations located in different biomes: coastal, Great Lakes, taiga, deciduous forests, deserts, Rocky Mountains.

**BIOL 482: Tropical Biology**

Cr. 1-4. Repeatable, maximum of 8 credits.

*Prereq: One year of college biology*

Students registering for courses taught by the Organization for Tropical Studies will receive credit for this ISU course when requesting a transfer of credits. Knowledge of Spanish desirable but not required.

**BIOL 483: Environmental Biogeochemistry**

(Cross-listed with ENSCI, GEOL). Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 12 credits in BIOL, CHEM, PHYS*

An exploration of biological, physical and geochemical impacts on the structure and function of ecosystems from local to global scales. Emphasis on the cycles of carbon, nitrogen, phosphorus, sulfur, and metals, and how these have been impacted by human activity. Topics may include biological feedbacks to climate change, microbial physiology and redox reactions, plant/soil feedbacks, terrestrial/aquatic linkages, early Earth processes and the origins of life.

**BIOL 484: Ecosystem Ecology**

(Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Combined 12 credits in BIOL, CHEM, and PHYS*

Introduction of the study of ecosystems and the biological and physical factors that influence their properties and dynamics. Conceptual foundations for ecosystem studies. Interactions among organisms, biological diversity, and ecosystem attributes. Quantitative analyses of accumulations, transformations, and fluxes of nutrients, water, and energy within and among ecosystems. Global change issues.

**BIOL 485: Community Ecology**

(Dual-listed with EEOB 585). (3-0) Cr. 3. S.

*Prereq: BIOL 312*

The effect of interspecific interactions on the structure and dynamics of natural and managed communities; including concepts of guild structure and trophic web dynamics and their importance to the productivity, diversity, stability, and sustainability of communities. The implications of interspecific interactions in the management of wild species will be emphasized with illustrative case histories of interactions between plants, invertebrates, and vertebrates.

**BIOL 486: Aquatic Ecology**

(Dual-listed with EEOB 586). (Cross-listed with A ECL, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**BIOL 486L: Aquatic Ecology Laboratory**

(Dual-listed with EEOB 586L). (Cross-listed with A ECL, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**BIOL 487: Microbial Ecology**

(Dual-listed with EEOB 587). (Cross-listed with ENSCI, GEOL, MICRO). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**BIOL 488: Identification of Aquatic Organisms**

(0-3) Cr. 1. F.S.

On-line taxonomic and identification exercises to accompany 486. Instruction and practice in the identification of algae, aquatic macrophytes, zooplankton, and benthos.

**BIOL 489: Population Ecology**

(Dual-listed with EEOB 589). (Cross-listed with A ECL). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**BIOL 490: Independent Study**

Cr. 1. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent study opportunities for undergraduate students in the biological sciences. No more than 9 credits in Biol 490 may be counted toward graduation and, of those, only 2 credits may be applied toward the Biology advanced course requirement.

**BIOL 491: Undergraduate Teaching Experience**

Cr. 1-2. Repeatable.

*Prereq: Permission of supervising staff*

For students registering to be undergraduate teaching assistants. Offered on a satisfactory-fail basis only. A maximum of 2 credits of BIOL 491 may be applied toward the Biology advanced course requirement.

**BIOL 492: Preparing for Graduate School in the Biological Sciences**

(1-0) Cr. 1. F.

*Prereq: For life science majors; Minimum requirement: sophomore standing.*

For students considering pursuing a graduate degree in the biological sciences. Professional development topics including the defining of academic and career areas of interest, finding and evaluating appropriate programs of graduate study, the graduate school application process, and developing a curriculum vita. Exploration of learning opportunities at field stations, research internships, and independent research activities.

**BIOL 494: Biology Internship**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 8 credits in BIOL; Permission of Instructor*

Professional experiences in biological sciences. Intended for Biology majors. No more than 9 credits in BIOL 494 may be counted toward graduation and, of those, only 6 credits may be applied toward the Biology advanced course requirement.

**BIOL 495: Undergraduate Seminar**

Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of Instructor*

Content varies from year to year and may include detailed discussion of special topics in biology, current issues in biology, or careers in biology.

**BIOL 498: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of the Biology Program Cooperative Education Coordinator*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**BIOL 499: Undergraduate Research Experience**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Permission of Instructor*

Research opportunities for undergraduate students in the biological sciences. Intended for Biology majors. No more than 9 credits in Biol 499 may be counted toward graduation and, of those, only 6 credits may be applied toward the Biology advanced course requirement.

## Biomedical Engineering (B M E)

***Any experimental courses offered by B M E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**B M E 220: Introduction to Biomedical Engineering**

(Cross-listed with CH E). (3-0) Cr. 3. S.

*Prereq: BIOL 212; (CHEM 167 or CHEM 177); (A B E 160 or AER E 160 or C E 160 or CH E 160 or CPR E 185 or E E 185 or ENGR 160 or I E 148 or M E 160 or S E 185); MATH 166; PHYS 232; PHYS 232L*

Engineering analysis of basic biology and engineering problems associated with living systems and health care delivery. The course will illustrate biomedical engineering applications in such areas as: biotechnology, biomechanics, biomaterials and tissue engineering, and biosignal and image processing, and will introduce the basic life sciences and engineering concepts associated with these topics.

**B M E 341: BioMEMs and Nanotechnology**

(Cross-listed with E E). (3-0) Cr. 3.

*Prereq: B M E 220*

Overview of Micro-Electro-Mechanical-System (MEMS) technologies for bioengineering, fundamentals of microfluidic device design, fabrication, and characterization, survey of microfluidic functional building blocks for lab-on-a-chip applications including mixers, valves, channels, and chambers. Topics of nanotechnology in bioengineering, nanoscale building block technologies for bioengineering including self-assembling, surface chemical treatment, nano-imprinting, nano-particles, nano-tubes, nano-wires, and stimuli-responsive biomaterials.

**B M E 352: Molecular, Cellular and Tissue Biomechanics**

(3-0) Cr. 3.

*Prereq: B M E 220; E M 324; MAT E 273*

Introduction to the anatomy of the musculoskeletal system and connective tissue. Range of movement, joint dislocation, bone deformity and fracture. Application of continuum mechanics to both living and non-living systems. Laws of motion, free-body diagrams and simple force analysis of musculoskeletal system. Biomechanical response of soft and hard tissues with emphasis on microstructure and mechanical properties. Applications to bioengineering design.

**B M E 440: Biomedical Applications of Chemical Engineering**

(Cross-listed with CH E). (3-0) Cr. 3.

*Prereq: (CH E 210 or CH E 220); (MATH 266 or MATH 267); PHYS 232*

Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

**B M E 447: Biomedical Design and Manufacturing**

(Cross-listed with I E). (3-0) Cr. 3.

*Prereq: Undergraduate students with three semesters or less before graduation while graduate standing for graduate students*

Exploration of biology, materials, body mechanics, manufacturing, quality control, and ethics and the intersection of these subjects as they relate to biomedical manufacturing. Study of medical data (CT, MRI, etc.) processing, biomedical design, 3D bioprinting and additive manufacturing concepts.

**B M E 450: Biosensors**

(Cross-listed with E E). (3-0) Cr. 3.

*Prereq: B M E 220*

Overview of biosensors and bioanalytical challenges; designing for performance including various analytical problems, ion-selective membranes, characteristics of enzymes and basics of bioaffinity sensing; fundamentals of bioselective layers including depositing films and membranes, surfaces for immobilization and bioselective agents; survey of different biosensing technologies including electroanalytical, biomembrane, optical, and acoustic-wave based sensors.

**B M E 450L: Biosensors Laboratory**

(Cross-listed with E E). (0-3) Cr. 1.

*Prereq: B M E 220; concurrent enrollment in B M E 450 or E E 450*

Laboratory course accompanying B M E 450. Design, fabrication, and characterization of various electrical, chemical, polymer, optical and acoustic sensors.

**B M E 456: Biomaterials**

(Cross-listed with MAT E). (3-0) Cr. 3. F.

*Prereq: CHEM 178; (MAT E 216 or MAT E 273 or MAT E 392)*

Presentation of the basic chemical and physical properties of biomaterials, including metals, ceramics, and polymers, as they are related to their manipulation by the engineer for incorporation into living systems. Role of microstructure properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

**B M E 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Professor in Charge of Bioengineering Minor*

Investigation of biomedical engineering topics of special interest to student and supervising faculty member with a final written report.

## Biomedical Sciences (B M S)

***Any experimental courses offered by B M S can be found at:***

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for professional curriculum students:****B M S 329: Anatomy and Physiology of Domestic Animals**

(3-0) Cr. 3. S.

*Prereq: BIOL 212; BIOL 212L*

Survey of body systems of domestic animals. Provides a medical science orientation particularly useful to students in a preveterinary medicine curriculum.

**B M S 330: Principles of Morphology I**

(Dual-listed with B M S 530). (4-6) Cr. 6. F.

*Prereq: 10 credits in biological science and permission of the instructor*

Anatomy of the dog and cat: from basics to clinical application.

**B M S 331: Principles of Morphology II**

(Dual-listed with B M S 531). (2-6) Cr. 4. S.

*Prereq: First-year classification in veterinary medicine. B M S 330*

Comparative and topographic anatomy of horse, ruminants, pig, and chicken.

**B M S 333: Biomedical Sciences I**

(Dual-listed with B M S 533). (5-3) Cr. 6. F.

*Prereq: First-year classification in veterinary medicine or graduate student status*

Microscopic anatomy and physiology of cells, tissues, cardiovascular system, respiratory system, and urinary system.

**B M S 334: Biomedical Sciences II**

(Dual-listed with B M S 534). (5-3) Cr. 6. S.

*Prereq: First-year classification in veterinary medicine or graduate student status*

Microscopic anatomy of the immune system and integument.

Microscopic anatomy and physiology of the digestive system, endocrine system, and reproductive system.

**B M S 335: Molecular and Cellular Basis of Disease**

(1-0) Cr. 1. F.

Descriptions of molecular and cellular biology especially as it pertains to veterinary medicine. Discussions of cellular components, cellular functions and anomalies thereof. Emphasis placed on divergences relevant to companion animals and livestock.

**B M S 336: Veterinary Nutrition**

(2-0) Cr. 2. F.

Introduce basic biochemical aspects of metabolism and function of energy, protein, fat, minerals and vitamins in the diet. Determine nutrient requirements of food animals, pets, and horses under various physiological states. Understand fate of various nutrients in simple stomached animals, ruminants, and cecal fermenters. Discuss clinical nutrition problems specific to each species.

**B M S 337: Neuroanatomy**

(Dual-listed with B M S 537). (2-2) Cr. 3. S.

*Prereq: 10 credits in biological science and permission of the instructor*  
Neuroanatomy of domestic animals.

**B M S 339: Clinical Foundations I**

(Cross-listed with V C S). (0-2) Cr. 1. F.

*Prereq: First-year classification in veterinary medicine*

Canine physical examination; basic behavior, animal handling and restraint; medical record keeping.

**B M S 345: Case Study I**

(0-2) Cr. 1. F.

*Prereq: First-year classification in veterinary medicine*

Clinical applications of basic sciences taught concurrently in the fall semester of the first year curriculum in veterinary medicine.

**B M S 346: Case Study II**

(0-1) Cr. 1. S.

*Prereq: First-year classification in veterinary medicine*

Clinical applications of basic sciences taught concurrently in the spring semester of the first year curriculum in veterinary medicine.

**B M S 354: General Pharmacology**

(Dual-listed with B M S 554). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: B M S 549 and B M S 552; BBMB 404, BBMB 405*

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

**B M S 401: Intro to Aquatic Animal Medicine**

(Cross-listed with A ECL). (1-2) Cr. 1. S.

8-week course. Introductory course with focus on fin fish production, health and medicine. Course content will help define future roles for veterinarians, producers, and service providers. Emphasis will be placed on water-evaluation, anatomy, pathology, infectious diseases, nutrition, regulatory constraints in production, food safety, biosecurity and current research. Field trip to aquaculture facility.

**B M S 403: Behavior of Domestic Animals**

(1-0) Cr. 1. Alt. S., offered odd-numbered years.

*Prereq: Vet Med Classification*

Normal and abnormal behavior of domestic animals.

**B M S 438: Principles of Physiology**

(Dual-listed with B M S 538). (4-0) Cr. 4. F.

*Prereq: 538: Graduate Student Standing or Permission of Instructor. 438: BIOL 212, BIOL 212L*

Principles of neurophysiology, endocrine and reproductive physiology, muscle physiology, cardiovascular, respiratory, renal, and digestive physiology, and regulation of body fluid.

**B M S 439: Principles of Pharmacology**

(Dual-listed with B M S 539). (4-0) Cr. 4. S.

*Prereq: A physiology course: B M S 329, BIOL 335 or equivalent; All non-graduate students must seek permission of the instructor in charge to register for B M S 539.*

General principles of drug actions; drug disposition; drug acting on, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems; anti-inflammatory and antibiotic drug; anti-cancer drugs; anesthetics CNS stimulants; lifestyle drugs; drug addiction, abuse and dependence; drugs in sport; drugs for obesity; biopharmaceuticals and gene therapy; drug development.

**B M S 443: Pharmacology and Therapeutics**

(Dual-listed with B M S 543). (3-0) Cr. 3. F.

*Prereq: B M S 354*

Pharmacology and therapeutic uses of fluids, antimicrobial and antiparasitic drugs, clinical use of veterinary drugs, and adverse drug reactions.

**B M S 447: Introduction to Human Gross Anatomy**

(Dual-listed with B M S 547). (2.5-6) Cr. 4. F.

*Prereq: Graduate standing and previous biology coursework or instructor permission.*

Examination of gross anatomy and neuroanatomy of the human. Laboratories will center on regional anatomy study through human cadaver dissection in addition to models, virtual learning solutions, radiologic imaging and case studies.

**B M S 448: Principles of Human Gross Anatomy**

Cr. 4. Repeatable, maximum of 2 times. S.SS.

*Prereq: BIOL 255 or equivalent AND an introductory biology course.*

BMS 448 will be a laboratory-centered course that focuses on prosected human cadavers to develop an in-depth understanding of human anatomical function. The course will follow a regional approach and stress relationships between neighboring anatomical structures. During laboratory sessions, students teams will study anatomy from multiple individuals to gain an appreciation for anatomical variation and effects on the body from aging, disease, etc. Additional laboratory activities include study in osteology, radiograph interpretation and case studies. Only one offering of BMS 448 may count towards graduation.



**B M S 490: Independent Study**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 490H: Independent Study, Honors**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 496: International Experience**

Cr. 1-12. Repeatable. S.

*Prereq: Vet Med Classification or Permission of Instructor*

International Preceptorships and Study Abroad Group programs.

Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**B M S 501: Selected Research Methods in Biomedical Sciences**

(0-8) Cr. 3. F.S.SS.

*Prereq: Graduate classification, permission of a BMS faculty member*

Experience in biomedical techniques in selected BMS laboratories that include but is not limited to cytochemical methods, molecular biological techniques, extracellular and intracellular unit recording, microiontophoresis, microinjection, spectrophotofluorometric analysis of chemicals, use of radioisotopes, radioimmunoassay, Ca<sup>2+</sup> imaging, confocal microscopy, fluorescence microscopy, and immunocytochemistry.

**B M S 502: Methods in Biomedical Sciences**

(0-6) Cr. 3. S.

*Prereq: Graduate Student Status or Permission of the Instructor*

Provides laboratory experience in the application of methods in biomedical sciences, including animal physiology and pharmacology laboratory techniques; human physiology recordings and urinalysis; pharmacokinetics; basic techniques in analytical laboratory; basic pathology, immunology, bacteriology, and virology laboratory techniques.

**B M S 503: Fundamentals of Biomedical Sciences**

Cr. 1. F.

*Prereq: Admission to B M S Graduate Program*

Institutional training essential for biomedical research, orientation to institutional career services and communication resources, professional development activities and practice with critical evaluation of data presentation and interpretation in biomedical literature.

**B M S 530: Principles of Morphology I**

(Dual-listed with B M S 330). (4-6) Cr. 6. F.

*Prereq: 10 credits in biological science and permission of the instructor*

Anatomy of the dog and cat: from basics to clinical application.

**B M S 531: Principles of Morphology II**

(Dual-listed with B M S 331). (2-6) Cr. 4. S.

*Prereq: First-year classification in veterinary medicine. B M S 330*

Comparative and topographic anatomy of horse, ruminants, pig, and chicken.

**B M S 533: Biomedical Sciences I**

(Dual-listed with B M S 333). (5-3) Cr. 6. F.

*Prereq: First-year classification in veterinary medicine or graduate student status*

Microscopic anatomy and physiology of cells, tissues, cardiovascular system, respiratory system, and urinary system.

**B M S 534: Biomedical Sciences II**

(Dual-listed with B M S 334). (5-3) Cr. 6. S.

*Prereq: First-year classification in veterinary medicine or graduate student status*

Microscopic anatomy of the immune system and integument.

Microscopic anatomy and physiology of the digestive system, endocrine system, and reproductive system.

**B M S 535: Molecular and Cellular Basis of Disease**

Cr. 1. S.

*Prereq: First-year classification in veterinary medicine or graduate student status.*

Descriptions of molecular and cellular biology, especially as it pertains to veterinary medicine. Discussions of cellular components, cellular functions and anomalies thereof. Emphasis placed on divergences relevant to companion animals and livestock.

**B M S 537: Neuroanatomy**

(Dual-listed with B M S 337). (2-2) Cr. 3. S.

*Prereq: 10 credits in biological science and permission of the instructor*  
Neuroanatomy of domestic animals.

**B M S 538: Principles of Physiology**

(Dual-listed with B M S 438). (4-0) Cr. 4. F.

*Prereq: 538: Graduate Student Standing or Permission of Instructor. 438: BIOL 212, BIOL 212L*

Principles of neurophysiology, endocrine and reproductive physiology, muscle physiology, cardiovascular, respiratory, renal, and digestive physiology, and regulation of body fluid.

**B M S 539: Principles of Pharmacology**

(Dual-listed with B M S 439). (4-0) Cr. 4. S.

*Prereq: A physiology course: B M S 329, BIOL 335 or equivalent; All non-graduate students must seek permission of the instructor in charge to register for B M S 539.*

General principles of drug actions; drug disposition; drug acting on, cardiovascular, respiratory, renal, gastrointestinal, and endocrine systems; anti-inflammatory and antibiotic drug; anti-cancer drugs; anesthetics CNS stimulants; lifestyle drugs; drug addiction, abuse and dependence; drugs in sport; drugs for obesity; biopharmaceuticals and gene therapy; drug development.

**B M S 542: Introduction to Molecular Biology Techniques**

(Cross-listed with EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**B M S 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**B M S 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**B M S 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**B M S 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**B M S 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**B M S 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**B M S 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**B M S 543: Pharmacology and Therapeutics**

(Dual-listed with B M S 443). (3-0) Cr. 3. F.

*Prereq: B M S 354*

Pharmacology and therapeutic uses of fluids, antimicrobial and antiparasitic drugs, clinical use of veterinary drugs, and adverse drug reactions.

**B M S 547: Introduction to Human Gross Anatomy**

(Dual-listed with B M S 447). (2.5-6) Cr. 4. F.

*Prereq: Graduate standing and previous biology coursework or instructor permission.*

Examination of gross anatomy and neuroanatomy of the human. Laboratories will center on regional anatomy study through human cadaver dissection in addition to models, virtual learning solutions, radiologic imaging and case studies.

**B M S 554: General Pharmacology**

(Dual-listed with B M S 354). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: B M S 549 and B M S 552; BBMB 404, BBMB 405*

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

**B M S 556: Cellular, Molecular and Developmental Neuroscience**

(Cross-listed with GDCB, NEURO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BIOL 335 or BIOL 436; physics recommended*

Fundamental principles of neuroscience including cellular and molecular neuroscience, nervous system development, and regulatory systems.

**B M S 575: Cell Biology**

(Cross-listed with TOX). (3-0) Cr. 3. F.

*Prereq: 10 credits in biological sciences and graduate student standing or permission of instructor*

A multi-instructor course covering major topics in cell structure and function, including: universal features of prokaryotic and eukaryotic cells, types of utilization and conversion of energy, genetic control of cell shape and functionality, internal organization of cells, communication between cells and their environment, development of multicellular systems. Students have to write a term paper.

**B M S 590: Special Topics**

Cr. 1-7. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 590A: Anatomy**

Cr. 1-7. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 590B: Physiology**

Cr. 1-7. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 590C: Pharmacology**

Cr. 1-7. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 590D: Cell biology**

Cr. 1-7. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 599: Creative Component**

Cr. 1-3. F.S.SS.

*Prereq: Enrollment in BMS graduate program, and permission of instructor.*

Creative component for non-thesis Master of Science degree.

**Courses for graduate students:**

**B M S 688: Research Review**

Cr. 1. Repeatable. F.

*Prereq: Enrollment in BMS graduate program.*

A forum for B M S students to gain experience in the critical exchange of ideas through oral presentation and discussion of scientific information.

**B M S 690: Advanced Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 690A: Anatomy**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 690B: Physiology**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 690C: Pharmacology**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 690D: Cell biology**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**B M S 698: Seminar**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

**B M S 698A: Seminar: Attendance**

Cr. R. Repeatable. F.S.

*Prereq: Enrollment in BMS graduate program.*

**B M S 698B: Seminar: Attendance and Presentation**

(1-0) Cr. 1. Repeatable. F.S.SS.

*Prereq: Enrollment in B M S graduate program.*

Attendance and presentation required. Offered on a satisfactory-fail basis only.

**B M S 698C: Seminar: Attendance and Report**

Cr. 1. Repeatable. F.S.

*Prereq: Enrollment in BMS graduate program.*

Attendance to all B M S seminars and written reports are required.

**B M S 699: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

**B M S 699A: Research: Anatomy**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

**B M S 699B: Research: Physiology**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

**B M S 699C: Research: Pharmacology**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

**B M S 699D: Research: Cell biology**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in BMS graduate program.*

# Business Administration (BUSAD)

**Any experimental courses offered by BUSAD can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) ([http://](http://registrar.iastate.edu/faculty-staff/courses/explisting/)

[www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/))

**Courses primarily for undergraduates:**

## **BUSAD 102: Business Learning Team Orientation**

(1-0) Cr. 1. F.S.

A required orientation for all College of Business Students involved with a Business Learning Team. Review of college and university requirements, transfer credits, academic planning, university policies and deadlines and registration procedures. Includes a consideration of various business majors and careers, tools for success in college including writing skills and presentations from employers, alumni and current students. Only one of BusAd 102 or BusAd 103 may be counted towards graduation.

## **BUSAD 103: Orientation**

(1-0) Cr. 1. F.S.

A required orientation for all College of Business students. Review of college and university requirements, transfer credits, academic planning, university policies and deadlines, and registration procedures. Includes group advising for course selection and registration. Only one of BUSAD 102 or BUSAD 103 may be counted toward graduation.

## **BUSAD 105: Exploration of Majors & Careers in Business**

Cr. 1. F.S.

Exploration course providing in-depth information and education regarding majors and related careers in business, with the goal for students of making a decision on which business major(s) to pursue. 8 week course. Offered on a satisfactory-fail basis only.

## **BUSAD 203: Professional Development in Business**

(1-0) Cr. 1.

*Prereq: BUSAD 102 or 103*

Designed to develop prepared, professional and engaged students directly aligned with current workplace competencies: individual and team strengths, professional branding, developing and implementing a professional job/internship search, resume and other professional job seeking communications, interviewing, evaluating offers, and networking. Team presentations will be a requirement of this course.

## **BUSAD 250: Applied Principles of Business**

(3-0) Cr. 3.

*Prereq: COM S 113*

Introduction to the functional areas of business and how the functional areas are integrated for the purpose of implementing business strategy. Introduces students to decision making tools (spreadsheets and databases) that are integral to business decision making. Includes application exercises to all functional areas of business.

## **BUSAD 292: Entrepreneurship & Innovation Learning Community (EILC) Seminar**

(1-0) Cr. 1.

Topics related to entrepreneurship and entrepreneurial thinking.

Presentations by entrepreneurs and faculty, field trips, business concept development.

## **BUSAD 301: Introduction to International Business**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore Classification*

Foundation for international business theory and practices with an emphasis on understanding the intersection of business, culture, politics, law, and economics. Views from both the United States and countries abroad will be presented.

## **BUSAD 391: Professional Experiential Learning**

Cr. 1. Repeatable, maximum of 6 credits.

*Prereq: 12 credits from College of Business; written approval of Career Services Internship Coordinator on required form prior to the learning experience.*

Supervised work experience in a business related discipline. Offered on a satisfactory-fail basis only.

## **BUSAD 391A: Professional Experiential Learning: Domestic Internship**

Cr. 1. Repeatable, maximum of 6 credits.

*Prereq: 12 credits from College of Business; written approval of Career Services Internship Coordinator on required form prior to the learning experience*

Supervised work experience in a business related discipline. Offered on a satisfactory-fail basis only.

## **BUSAD 391B: Professional Experiential Learning: International Internship**

Cr. 1. Repeatable, maximum of 6 credits.

*Prereq: 12 credits from College of Business; written approval of Career Services Internship Coordinator on required form prior to the learning experience*

Supervised work experience in a business related discipline. Offered on a satisfactory-fail basis only.

## **BUSAD 391C: Professional Experiential Learning: Domestic Travel and Study**

Cr. 1. Repeatable, maximum of 6 credits.

*Prereq: 12 credits from College of Business; written approval of Career Services Internship Coordinator on required form prior to the learning experience*

Supervised travel and study in a business related discipline. Offered on a satisfactory-fail basis only.

**BUSAD 391D: Professional Experiential Learning: International Travel and Study**

Cr. 1. Repeatable, maximum of 6 credits.

*Prereq: 12 credits from College of Business; written approval of Career Services Internship Coordinator on required form prior to the learning experience*

Supervised travel and study in a business related discipline. Offered on a satisfactory-fail basis only.

**BUSAD 398: Cooperative Education**

Cr. R. Repeatable, maximum of 3 times.

*Prereq: Permission of department*

Required of all cooperative education students engaged in full-time internship/co-op. Students must register for this course prior to commencing each work period. No more than three credits may be taken in addition to BusAd 398 during any given semester. Offered on a satisfactory-fail basis only.

**BUSAD 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: Professional program in Business; permission of instructor; for 490H: Admission to the Business Honors Program*

**BUSAD 490A: Independent Study: International Business**

Cr. 1-3. Repeatable.

*Prereq: Professional program in Business; permission of instructor*

**BUSAD 490C: Independent Study: Consulting, Investment Banking and Related Industries**

(1-4) Cr. 3. F.S.SS.

*Prereq: Permission of Instructor*

Application of course learning to solve real-life business problems. Through the combination of significant experiential-learning activities, online academic lectures and readings, and writing assignments, this course will provide students with unique experiences to enhance skills such as formulating problems, structuring and prioritizing problems, synthesizing results, and communicating intuition from complicated analyses.

**BUSAD 490E: Independent Study: Entrepreneurship**

Cr. 1-3. Repeatable.

*Prereq: senior classification, permission of instructor*

**BUSAD 490G: Independent Study: General**

Cr. 1-3. Repeatable.

*Prereq: Professional program in Business; permission of instructor*  
Independent Study.

**BUSAD 490H: Independent Study: Honors**

Cr. 1-3. Repeatable.

*Prereq: Admission to the Business Honors Program*

**BUSAD 491: Okoboji Entrepreneurship Institute**

Cr. 1.

*Prereq: Selection to Okoboji Entrepreneurship Institute*

Advanced study of entrepreneurship that includes a team-based entrepreneurial simulation, seminars with successful entrepreneurs and business community leaders, a formal pitch presentation, and networking and mentoring in an immersive experiential environment. Students must apply and be selected for participation. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**BUSAD 501: Strategic Management**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Critical analysis of current practice and case studies in strategic management with an emphasis on integrative decision making. Strategy formulation and implementation will be investigated in the context of complex business environments.

**BUSAD 502: Quantitative Business Analysis and Decision Making**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or departmental permission*

Introduction to the sources and statistical analysis of data as well as optimization models for use in making business decisions. Data collection, descriptive and inferential statistics including hypothesis testing, analysis of variance, multiple regression, linear programming and simulation.

**BUSAD 503: Information Systems**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Introduction to a broad variety of information systems (IS) topics, including current and emerging developments in information technology (IT), IT strategy in the context of corporate strategy, and IS planning and development of enterprise architectures. Cases, reading, and discussions highlight the techniques and tactics used by managers to cope with strategic issues within an increasingly technical and data-driven competitive environment.



**BUSAD 504: Marketing and Logistics**

(Cross-listed with STB). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Integration of the business functions concerned with the marketing and movement of goods along the supply chain with the primary goal of creating value for the ultimate customer. Coordination of marketing, production, and logistics activities within the firm and with outside suppliers and customers in the supply chain.

**BUSAD 507: Organizational Behavior**

(Cross-listed with STB). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Understanding human behavior in organizations, and the nature of organizations from a managerial perspective. Special emphasis on how individual differences, such as perceptions, personality, and motivation, influence individual and group behavior in organizations and on how behavior can be influenced by job design, leadership, groups, and the structure of organizations.

**BUSAD 508: Accounting and Finance**

(Cross-listed with STB). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of fundamental topics in accounting and finance. Financial statement reporting and analysis for agriculture firms, corporate governance issues related to financial reporting, (e.g., Sarbanes-Oxley). Basic tools and techniques used in financial management, including stock and bond valuation. How to assess and use capital budgeting methods to evaluate proposed firm investments.

**BUSAD 509: International Seed Business Practices, Policies, & Regulation**

(Cross-listed with STB). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Cultural, financial, economic, political, legal/regulatory environments shaping an organization's international business strategy. Topics include entry (and repatriation) of people, firms, goods, services, and capital. Special attention to the institutions of seed regulation and policy. Ethical issues facing managers operating in an international context.

**BUSAD 590: Special Topics in Business**

(3-0) Cr. 3. Repeatable.

*Prereq: Enrollment in MBA program or departmental permission.*

A special topics course covering contemporary issues in business. Topics vary by semester.

**BUSAD 591: Professional Experiential Learning**

Cr. 1-5. Repeatable.

*Prereq: Graduate standing; written approval of supervising instructor and department chair on required form prior to the learning experience*

Academically supervised travel and/or work experiences in a business related discipline.

**BUSAD 592: MBA Professional Skills Development**

Cr. R.

*Prereq: Admission to Full-time MBA Program*

Provides first-year MBA students with tools necessary to develop and implement a successful internship and career search, and to develop professional skills critical for success in the competitive business environment. Topics include career search strategy, resume and cover letter development, interviewing, strategic networking, salary negotiation, impression management, team skills development, presentation skills development, and business etiquette. Required for all full-time MBA students. Offered on a satisfactory-fail basis only.

**BUSAD 594: MBA Professional Skills Development II**

Cr. R.

*Prereq: BUSAD 592*

A second course designed to improve the professional skills of first-year MBA students. Emphasis on building effective communications and networking skills. Students will participate in professional workshops, company visits, executive speaker seminars, service learning projects, business case competitions, and related activities. Offered on a satisfactory-fail basis only.

**BUSAD 597: Part-Time Cooperative Education**

Cr. R. Repeatable.

*Prereq: Permission of Instructor*

Career development growth through a process of analyzing and reporting experiential learning endeavors. Students may complete this course during or pursuant to completion of a summer- or semester-length internship or co-op experience. International students must have completed two graduate course semesters at Iowa State University before taking the course. Offered on a satisfactory-fail basis only.

**BUSAD 598: Cooperative Education**

Cr. R.

*Prereq: Permission of instructor*

Professional work experience. Students must register for this course prior to commencing work. Offered on a satisfactory-fail basis only.

**BUSAD 599: Creative Component**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.



**BUSAD 599A: Creative Component: Accounting**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599C: Creative Component: Finance**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599E: Creative Component: Management**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599F: Creative Component: Marketing**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599I: Creative Component: Agribusiness**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599J: Creative Component: General Business**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599K: Creative Component: Management Information Systems**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**BUSAD 599L: Creative Component: Supply Chain Management**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**Courses for graduate students:****BUSAD 644: Business Research Methods**

(3-0) Cr. 3. F.

*Prereq: In PhD program in the College of Business or consent of instructor*  
A survey of the wide variety of research methods used in business. Methods will be presented and discussed with emphasis on applicability in different research situations.

**BUSAD 699: Research**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: Graduate classification, permission of major professor*  
Research.

## Chemical Engineering (CH E)

**Any experimental courses offered by CH E can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****CH E 104: Chemical Engineering Learning Community**

Cr. R. F.

*Prereq: Enrollment in Chemical Engineering Learning Team*  
(1-0) Curriculum in career planning and academic course support for Freshmen learning team.

**CH E 160: Chemical Engineering Problems with Computer Applications Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*  
Formulation and solution of engineering problems. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to material balances, engineering economics, and design. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. Chemical Engineering examples. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, CH E 160, C E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**CH E 202: Chemical Engineering Seminar**

Cr. R. F.

Professionalism in the context of the engineering/technical workplace. Introduction to chemical engineering career opportunities. Process and workplace safety. Development and demonstration of key workplace competencies: teamwork, professionalism and ethical responsibility, ability to engage in life-long learning, and knowledge of contemporary issues. Resumes; professional portfolios; preparation for internship experiences. Restricted to CHE majors. Offered on a satisfactory-fail basis only.

**CH E 204: Chemical Engineering Continuing Learning Community**

Cr. R.

*Prereq: Enrollment in Chemical Engineering Learning Team*  
Curriculum and career planning, academic course support for learning community.

**CH E 205: Chemical Engineering Progress Assessment**

Cr. R. F.S.

*Prereq:* Credit or concurrent enrollment in CH E 160; CHEM 178; MATH 166

Assessment of proficiency in general chemistry, calculus (including infinite series and applications of derivatives and integrals), and material balances, and an ability to use the principles of science and mathematics to identify, formulate, and solve engineering problems. Offered on a satisfactory-fail basis only.

**CH E 210: Material and Energy Balances**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 160; CHEM 178; MATH 166

Introduction to chemical processes. Physical behavior of gases, liquids, and solids. Application of material and energy balances to chemical engineering equipment and processes.

**CH E 220: Introduction to Biomedical Engineering**

(Cross-listed with B M E). (3-0) Cr. 3. S.

*Prereq:* BIOL 212; (CHEM 167 or CHEM 177); (A B E 160 or AER E 160 or C E 160 or CH E 160 or CPR E 185 or E E 185 or ENGR 160 or I E 148 or M E 160 or S E 185); MATH 166; PHYS 232; PHYS 232L

Engineering analysis of basic biology and engineering problems associated with living systems and health care delivery. The course will illustrate biomedical engineering applications in such areas as: biotechnology, biomechanics, biomaterials and tissue engineering, and biosignal and image processing, and will introduce the basic life sciences and engineering concepts associated with these topics.

**CH E 290: Introduction to Undergraduate Research/Independent Study**

Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

*Prereq:* Permission of Instructor

Introduction to independent study with emphasis on skills necessary to pursue further independent study of a topic of special interest to student and faculty. Topics may include introductions to laboratory safety, standard operating procedures, design of experiments, data analysis, computational methods, literature searches, and professional communications. Pre-enrollment contract between student and instructor required. Offered on a satisfactory-fail basis only. Not applicable to the B.S. in Chemical Engineering degree.

**CH E 310: Computational Methods in Chemical Engineering**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 160; CH E 205; CH E 210; MATH 265

Numerical methods for solving systems of linear and nonlinear equations, ordinary differential equations, numerical differentiation and integration, and nonlinear regression using chemical engineering examples.

**CH E 325: Chemical Engineering Laboratory I**

(0-4) Cr. 2. F.S.

*Prereq:* CH E 357; CH E 381; (credit or concurrent enrollment in ENGL 309 or ENGL 312 or ENGL 314 or JL MC 347)

Experiments covering fundamental material and energy balances, momentum and energy transport operations, and thermodynamics. Computer applications.

**CH E 356: Transport Phenomena I**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 205; CH E 210; PHYS 231; PHYS 231L; credit or concurrent enrollment in MATH 267

Momentum and mechanical energy balances. Incompressible and compressible fluid flow. Applications to fluid drag, piping system design, filtration, packed beds and settling.

**CH E 357: Transport Phenomena II**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 356

Conduction and diffusion, convective heat and mass transfer, boiling and condensation, radiation, and design of heat exchange equipment. Introduction to diffusion. Credit for only FS HN 351 or CH E 357 may be applied toward graduation for the Food Science major or Food Science minor

**CH E 358: Separations**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 310; CH E 357; CH E 381

Diffusion and mass transfer in fluids. Analysis and design of continuous contacting and multistage separation processes. Binary and multicomponent distillation, absorption, extraction, evaporation, membrane processes, and simultaneous heat and mass transfer.

**CH E 381: Chemical Engineering Thermodynamics**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 202; CHEM 325; MATH 267; PHYS 232; (credit or concurrent enrollment in CH E 310; PHYS 232L)

Application of thermodynamic principles to chemical engineering problems. Thermodynamic properties of fluids, phase equilibria, and chemical reaction equilibria.

**CH E 382: Chemical Reaction Engineering**

(3-0) Cr. 3. F.S.

*Prereq:* CH E 310; CH E 381; credit or concurrent enrollment in CH E 357

Kinetics of chemical reactions. Design of homogeneous and heterogeneous chemical reactors.

**CH E 391: Foreign Study Orientation**

(3-0) Cr. 3. S.

*Prereq: CH E 357; CH E 381; (credit or concurrent enrollment in ENGL 309 or ENGL 312 or ENGL 314 or JL MC 347)*

Offered on a satisfactory-fail basis only. Credit for graduation allowable only upon completion of Ch E 392.

Meets International Perspectives Requirement.

**CH E 392: Foreign Study Program**

Cr. 4. SS.

*Prereq: CH E 358; CH E 382; CH E 391*

Study of chemical engineering including laboratories and lectures at collaborating international universities. Comparative study of U.S. and international manufacturing facilities. Expenses required.

Meets International Perspectives Requirement.

**CH E 406: Environmental Chemodynamics**

(Dual-listed with CH E 506). (3-0) Cr. 3.

*Prereq: CHE 357; CH E 381*

Examines the mechanisms and rates of chemical transport across air, water, and soil interfaces. Applications of transport and thermodynamic fundamentals to movement of chemicals in the environment.

**CH E 408: Surface and Colloid Chemistry**

(Dual-listed with CH E 508). (3-0) Cr. 3.

*Prereq: CH E 381*

Examines the factors underlying interfacial phenomena, with an emphasis on the thermodynamics of surfaces, structural aspects, and electrical phenomena. Application areas include emulsification, foaming, detergency, sedimentation, fluidization, nucleation, wetting, adhesion, flotation, and electrophoresis.

**CH E 410: Electrochemical Engineering**

(Dual-listed with CH E 510). (3-0) Cr. 3. F.

*Prereq: CH E 357; CH E 381; CH E 382*

Electrochemical engineering principles in thermodynamics, electrode kinetics, charge and mass transport; modeling and simulation; electrocatalysis; electrochemical reactions; applications of electrochemical engineering in fuel cells, batteries and electrolyzers.

**CH E 412: Core Concepts in Chemical Engineering**

(3-0) Cr. 3. S.SS.

*Prereq: CHEM 325; MATH 267; PHYS 231; PHYS 231L*

Survey of the engineering science fundamentals in chemical engineering. Topics include material balances, energy balances, thermodynamics, transport phenomena, and reaction engineering. Credit for ChE 412 may not be applied to any undergraduate or graduate degree programs in chemical engineering.

**CH E 415: Biochemical Engineering**

(Dual-listed with CH E 515). (3-0) Cr. 3.

*Prereq: (BBMB 301 or BBMB 303 or BBMB 404); CH E 357; CHEM 331*

Application of basic chemical engineering principles in biochemical and biological process industries such as enzyme technology and fermentation.

**CH E 420: Chemical Process Safety**

(3-0) Cr. 3. F.S.

*Prereq: CH E 357; CH E 381*

Application of transport phenomena, thermodynamics, and chemical kinetics to the study of safety, health, and loss prevention. Government regulations, industrial hygiene, relief sizing, runaway reactions, toxic release, and dispersion models will be used. Fires, explosions, risk assessment, hazard identification, case studies, accident investigations, and design considerations will be studied.

**CH E 421: Process Control**

(3-0) Cr. 3. F.S.

*Prereq: CH E 358; CH E 382; MATH 267*

Control of industrial chemical processes. Device applications and limitations. Dynamics of chemical process components and process control systems.

**CH E 426: Chemical Engineering Laboratory II**

(0-4) Cr. 2. F.S.

*Prereq: CH E 325; CH E 358; CH E 382*

Experiments in heat and mass transfer, staged operations, chemical reactor performance, unit processes. Computer applications. Only one of Ch E 426 or 427 may count toward graduation.

**CH E 427: Biological Engineering Laboratory**

(0-4) Cr. 2. S.

*Prereq: (BBMB 301 or BBMB 303 or BBMB 404); CH E 325; CH E 358; CH E 382*

Experiments on biological applications in chemical engineering. Only one of CH E 426 or CH E 427 may count toward graduation.

**CH E 429: Chemical Engineering Product Design**

(3-0) Cr. 3. F.S.

*Prereq: CH E 358 and CH E 382*

Application of core chemical engineering concepts to product design. Market and economic analysis, and technical feasibility. Literature and intellectual property search. Environmental, regulatory, and safety considerations.

**CH E 430: Process and Plant Design**

(2-4) Cr. 4. F.S.

*Prereq: CH E 358; CH E 382*

Synthesis of chemical engineering processes, equipment and plants. Cost estimation and feasibility analysis.

**CH E 440: Biomedical Applications of Chemical Engineering**

(Dual-listed with CH E 540). (Cross-listed with B M E). (3-0) Cr. 3.

*Prereq: (CH E 210 or CH E 220); (MATH 266 or MATH 267); PHYS 232*

Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

**CH E 447: Polymers and Polymer Engineering**

(Dual-listed with CH E 547). (3-0) Cr. 3.

*Prereq: CHEM 331; (CH E 382 or MAT E 351)*

Chemistry of polymers, addition and condensation polymerization. Physical and mechanical properties, polymer rheology, production methods. Applications of polymers in the chemical industry.

**CH E 490: Undergraduate Research/Independent Study**

(0-18) Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: Permission of Department*

Investigation of topics of special interest to student and faculty with a final written report or presentation. Election of course and topic must be approved in advance by Department with completion of Study Proposal. No more than 6 credits of ChE 490 may be counted towards technical electives.

**CH E 490H: Undergraduate Research/Independent Study, Honors**

(0-18) Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: Permission of Department*

Investigation of topics of special interest to student and faculty with a final written report or presentation. Election of course and topic must be approved in advance by Department with completion of Study Proposal. No more than 6 credits of ChE 490 may be counted towards technical electives.

**CH E 499: Applied Industrial Research**

Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: CH E 205; CH E 210; Permission Instructor*

Application of core chemical engineering concepts to solve industrially-sponsored process design problems in teams. Introduction to literature review and analysis, intellectual property, and project management.

**Courses primarily for graduate students, open to qualified undergraduates:**

**CH E 506: Environmental Chemodynamics**

(Dual-listed with CH E 406). (3-0) Cr. 3.

*Prereq: CHE 357; CH E 381*

Examines the mechanisms and rates of chemical transport across air, water, and soil interfaces. Applications of transport and thermodynamic fundamentals to movement of chemicals in the environment.

**CH E 508: Surface and Colloid Chemistry**

(Dual-listed with CH E 408). (3-0) Cr. 3.

*Prereq: CH E 381*

Examines the factors underlying interfacial phenomena, with an emphasis on the thermodynamics of surfaces, structural aspects, and electrical phenomena. Application areas include emulsification, foaming, detergency, sedimentation, fluidization, nucleation, wetting, adhesion, flotation, and electrophoresis.

**CH E 510: Electrochemical Engineering**

(Dual-listed with CH E 410). (3-0) Cr. 3. F.

*Prereq: CH E 357; CH E 381; CH E 382*

Electrochemical engineering principles in thermodynamics, electrode kinetics, charge and mass transport; modeling and simulation; electrocatalysis; electrochemical reactions; applications of electrochemical engineering in fuel cells, batteries and electrolyzers.

**CH E 515: Biochemical Engineering**

(Dual-listed with CH E 415). (3-0) Cr. 3.

*Prereq: (BBMB 301 or BBMB 303 or BBMB 404); CH E 357; CHEM 331*

Application of basic chemical engineering principles in biochemical and biological process industries such as enzyme technology and fermentation.

**CH E 540: Biomedical Applications of Chemical Engineering**

(Dual-listed with CH E 440). (3-0) Cr. 3.

*Prereq: (CH E 210 or CH E 220); (MATH 266 or MATH 267); PHYS 232*

Applications of material and energy balances, transport phenomena, chemical reaction engineering, and thermodynamics to problems in biomedical engineering and applied physiology; survey of biomedical engineering; biomaterials; biomedical imaging.

**CH E 542: Polymeric Biomaterials**

(3-0) Cr. 3.

*Prereq: CHEM 331 or a polymers class*

Polymeric biomaterials, overview of biomaterial requirements, different classes of polymers used as biomaterials, specific bioapplications of polymers.

**CH E 545: Analytical and Numerical Methods**

(3-0) Cr. 3. F.

*Prereq: CH E 358, MATH 267*

Analysis of equipment and processes by analytic and/or numerical solution of descriptive differential equations. Operational and series techniques, boundary value problems, numerical interpolation and approximation, integration techniques.

**CH E 547: Polymers and Polymer Engineering**

(Dual-listed with CH E 447). (3-0) Cr. 3.

*Prereq: CHEM 331; (CH E 382 or MAT E 351)*

Chemistry of polymers, addition and condensation polymerization. Physical and mechanical properties, polymer rheology, production methods. Applications of polymers in the chemical industry.

**CH E 554: Integrated Transport Phenomena**

(4-0) Cr. 4. F.

*Prereq: CH E 357, CH E 381, Math 267, credit or enrollment in CH E 545*

Conservation equations governing diffusive and convective transport of momentum, thermal energy and chemical species. Transport during laminar flow in conduits, boundary layer flow, creeping flow. Heat and mass transport coupled with chemical reactions and phase change. Scaling and approximation methods for mathematical solution of transport models. Diffusive fluxes; conservation equations for heat and mass transfer; scaling and approximation techniques; fundamentals of fluid mechanics; unidirectional flow; creeping flow; laminar flow at high Reynolds number; forced-convection heat and mass transfer in confined and unconfined laminar flows.

**CH E 562: Bioseparations**

(3-0) Cr. 3.

*Prereq: CH E 357 or advanced standing in a science major*

Principles and techniques for separation and recovery of biologically-produced molecules, especially proteins. Relationship between the chemistry of biological molecules and efficient separation and preservation of biological activity. Includes centrifugation and filtration, membrane processing, extraction, precipitation and crystallization, chromatography, and electrophoresis.

**CH E 572: Turbulence**

(Cross-listed with AER E). (3-0) Cr. 3.

*Prereq: AER E 541 or M E 538*

Qualitative features of turbulence. Statistical representation of turbulent velocity fields: averages, moments, correlations, length and time scales and the energy cascade. Averaged equations of motion, closure requirements, Reynolds averaged models. Homogeneous shear flows, free shear flows, boundary layers. Numerical simulation of turbulence: DNS, LES, DES.

**CH E 583: Advanced Thermodynamics**

(3-0) Cr. 3. F.

*Prereq: CH E 381*

Application of thermodynamic principles to chemical engineering problems. Thermodynamic properties of non-ideal fluids and solutions; phase and chemical-reaction equilibria/stability.

**CH E 587: Advanced Chemical Reactor Design**

(3-0) Cr. 3. S.

*Prereq: CH E 382*

Analysis of complex reactions and kinetics. Fixed bed, fluidized bed, and other industrial reactors. Analysis and design of non-ideal flow mixing, and residence times. Heterogeneous reactors.

**CH E 590: Independent Study**

Cr. 2-6. Repeatable.

Investigation of an approved topic on an individual basis.

**CH E 595: Special Topics**

Cr. 2-3. Repeatable.

**CH E 595A: Special Topics: Separations**

Cr. 2-3. Repeatable.

**CH E 595B: Special Topics: Advanced Control Theory**

Cr. 2-3. Repeatable.

**CH E 595C: Special Topics: Crystallization**

Cr. 2-3. Repeatable.

**CH E 595D: Special Topics: Thermodynamics**

Cr. 2-3. Repeatable.

**CH E 595E: Special Topics: Protein Engineering/Bioseparations**

Cr. 2-3. Repeatable.

**CH E 595F: Special Topics: Biological Engineering**

Cr. 2-3. Repeatable.

**CH E 595G: Special Topics: Materials and Biomaterials**

Cr. 2-3. Repeatable.

**CH E 595H: Special Topics: Surfaces**

Cr. 2-3. Repeatable.

**CH E 595I: Special Topics: Combinatorial Design**

Cr. 2-3. Repeatable.

**CH E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:****CH E 601: Seminar**

Cr. R. Repeatable. F.S.

Offered on a satisfactory-fail basis only.

**CH E 625: Metabolic Engineering**

(3-0) Cr. 3.

*Prereq: CH E 382, CHEM 331*

Principles of metabolic engineering. Emphasis on emerging examples in biorenewables and plant metabolic engineering. Overview of biochemical pathways, determination of flux distributions by stoichiometric and labeling techniques; kinetics and thermodynamics of metabolic networks; metabolic control analysis; genetic engineering for overexpression, deregulation, or inhibition of enzymes; directed evolution; application of bioinformatics, genomics, and proteomics.

**CH E 632: Multiphase Flow**

(Cross-listed with M E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: M E 538*

Single particle, multiparticle and two-phase fluid flow phenomena (gas-solid, liquid-solid and gas-liquid mixtures); particle interactions, transport phenomena, wall effects; bubbles, equations of multiphase flow. Dense phase (fluidized and packed beds) and ducted flows; momentum, heat and mass transfer. Computer solutions.

**CH E 642: Principles and Applications of Molecular Simulation**

(3-0) Cr. 3.

*Prereq: CH E 545*

Principles of statistical physics. General features of molecular simulations including Monte Carlo (MC) methods, molecular mechanics (MM), and molecular dynamics (MD). Overview of intermolecular and interatomic potentials. Evaluation of phase equilibria, free energies, and surface/interfacial properties. Coarse-grained methods.

**CH E 688: Catalysis and Catalytic Processes**

(3-0) Cr. 3.

*Prereq: CH E 382*

Principles and applications of heterogeneous and homogeneous catalysis. Adsorption. Reaction kinetics and mass transfer effects. Catalyst characterization. Industrial catalytic processes.

**CH E 692: Independent Study**

Cr. 2-6. Repeatable.

Investigation of an approved topic on an individual basis. Election of course and topic must be approved in advance by Program of Study Committee.

**CH E 695: Advanced Topics**

Cr. arr. Repeatable.

**CH E 695A: Advanced Topics: Separations**

Cr. arr. Repeatable.

**CH E 695B: Advanced Topics: Advanced Statistical Modeling and Control**

Cr. arr. Repeatable.

**CH E 695C: Advanced Topics: Crystallization**

Cr. arr. Repeatable.

**CH E 695D: Advanced Topics: Thermodynamics**

Cr. arr. Repeatable.

**CH E 695E: Advanced Topics: Protein Engineering/Bioseparations**

Cr. arr. Repeatable.

**CH E 695F: Advanced Topics: Biological Engineering**

Cr. arr. Repeatable.

**CH E 695G: Advanced Topics: Materials and Biomaterials**

Cr. arr. Repeatable.

**CH E 695H: Advanced Topics: Surfaces**

Cr. arr. Repeatable.

**CH E 695I: Advanced Topics: Combinatorial Design**

Cr. arr. Repeatable.

**CH E 695J: Advanced Topics: Polymeric and Nanostructured Materials**

Cr. arr. Repeatable.

**CH E 695K: Advanced Topics: Biomaterials and Tissue Engineering**

Cr. arr. Repeatable.

**CH E 695L: Advanced Topics: Catalysis, Reaction Engineering, and Renewable Energy**

Cr. arr. Repeatable.

**CH E 697: Engineering Internship**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of major professor, graduate classification*

One semester and one summer maximum per academic year professional work period.

**CH E 698: Chemical Engineering Teaching Practicum**

(1-0) Cr. 1. F.S.SS.

*Prereq: Graduate student classification and permission of instructor*

Offered on a satisfactory-fail basis only.

**CH E 698A: Chemical Engineering Teaching Practicum: Teaching Practicum**

(1-0) Cr. 1. F.

*Prereq: Graduate student classification and permission of instructor*

Discussions intended to foster the development of graduate students as teaching assistants and future chemical engineering instructors. Topics include classroom and laboratory instruction, grading, and developing a teaching philosophy. Offered on a satisfactory-fail basis only.



**CH E 698B: Chemical Engineering Teaching Practicum: Teaching Experience**

(1-0) Cr. 1. Repeatable. F.S.SS.

*Prereq: CH E 698A*

Participation in the instruction of a CH E course under the mentorship of a CBE faculty member. Typical activities may include lecture preparation and delivery, laboratory instruction, design of assessments, problem-solving sessions, office hours, and grading. Offered on a satisfactory-fail basis only.

**CH E 699: Research**

Cr. arr. Repeatable.

Advanced topic for thesis/dissertation.

## Chemistry (CHEM)

*Any experimental courses offered by CHEM can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****CHEM 050: Preparation for College Chemistry**

(3-0) Cr. 0. F.S.

An in-depth active learning experience designed to impart the fundamental concepts and principles of chemistry, with an emphasis on mathematics skills and logical thinking. For students intending to enroll in general chemistry and who have not taken high school chemistry or who have not had a high school college preparatory chemistry course who need a review of chemical problem solving and chemical concepts. 1 year high school algebra recommended. Credit for Chem 50 does not count toward graduation.

**CHEM 101: Chemistry Learning Community Orientation**

(1-0) Cr. 1. F.S.

Integration of first year and transfer students into the chemistry program. Introduction and overview of degree requirements and support services on campus, assistance with transition to college and community life, and team-building and leadership activities. Offered on a satisfactory-fail basis only.

**CHEM 101A: Chemistry Learning Community Orientation: On-Campus Orientation**

(1-0) Cr. 1. F.

Integration of first year and transfer students into the chemistry program. Introduction and overview of degree requirements and support services on campus, assistance with transition to college and community life, and team-building and leadership activities. Offered on a satisfactory-fail basis only.

**CHEM 101B: Chemistry Learning Community Orientation: Professional Development Opportunities**

(1-0) Cr. 1. S.

Integration of first year and transfer students into the chemistry program. Introduction and overview of degree requirements and support services on campus, assistance with transition to college and community life, and team-building and leadership activities. Offered on a satisfactory-fail basis only.

**CHEM 102L: Physical Sciences for Elementary Education**

(Cross-listed with PHYS). (1-4) Cr. 3. F.S.

*Prereq: MATH 140 or MATH 195*

Physical science principles for future elementary teachers. Emphasis on experiments that address current elementary science education standards and that are appropriate for their future students to do, such as measurements of mass, length, time, light from atoms, charge and current, motion due to forces, energy and work, heat, waves, optics, building bridges and making musical instruments, studying states of matter and chemical reactions.

**CHEM 110: Cutting-Edge Chemistry: Research and Career Opportunities**

(1-0) Cr. 1. F.

Overview of careers in chemistry: industrial, governmental, and academic careers; literature and compound search instruction; professional ethics; and an introduction to joining a research lab. For students majoring or minoring in chemistry or chemistry-related fields. Offered on a satisfactory-fail basis only.

**CHEM 160: Chemistry in Modern Society**

(3-0) Cr. 3. F.S.

Aspects of chemistry visible to a non-scientist in our society. A survey of selected areas of chemistry with emphasis on the interface between chemistry and other fields of human activity.

**CHEM 163: College Chemistry**

(4-0) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 163L*

A general survey of chemistry with an emphasis on conceptual problems for those who are not physical and biological science or engineering majors. Nomenclature, chemical reactions, stoichiometry, atomic structure, periodic properties, chemical bonding, states of matter, solutions, thermochemistry, acid-base theory, oxidation-reduction reactions, basic chemical kinetics, and chemical equilibrium. 1 year of high school algebra and geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 163L: Laboratory in College Chemistry**

(0-3) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 163*

Laboratory to accompany CHEM 163. Must be taken with CHEM 163.

Only one of Chem 163L, CHEM 167L, and CHEM 177L may count toward graduation.

**CHEM 167: General Chemistry for Engineering Students**

(4-0) Cr. 4. F.S.

Principles of chemistry and properties of matter explained in terms of modern chemical theory with emphasis on topics of general interest to the engineer. MATH 140 or 2 years of high school algebra and 1 year of high school geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 167L: Laboratory in General Chemistry for Engineering**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in CHEM 167*

Laboratory to accompany 167. Only one of Chem 163L, 167L, and 177L may count toward graduation.

**CHEM 177: General Chemistry I**

(4-0) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 177L*

The first semester of a two semester sequence which explores chemistry at a greater depth and with more emphasis on concepts, problems, and calculations than 163. Recommended for physical and biological science majors, chemical engineering majors, and all others intending to take 300-level chemistry courses. Principles and quantitative relationships, stoichiometry, chemical equilibrium, acid-base chemistry, thermochemistry, rates and mechanism of reactions, changes of state, solution behavior, atomic structure, periodic relationships, chemical bonding. Chemistry and Biochemistry majors may consider taking CHEM 201. MATH 140 or 2 years of high school algebra and 1 year of high school geometry and CHEM 50 or 1 year of high school chemistry necessary. Only one of Chem 163, 167, 177, or 201 may count toward graduation.

**CHEM 177L: Laboratory in General Chemistry I**

(0-3) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 177*

Laboratory to accompany 177. 177L must be taken with 177. Only one of Chem 163L, 167L, and 177L may count toward graduation.

**CHEM 177N: Laboratory in General Chemistry I**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in CHEM 177*

Laboratory to accompany CHEM 177. CHEM 177N must be taken with CHEM 177. For Chemistry and Biochemistry majors. Laboratory to accompany CHEM 177. CHEM 177N must be taken with CHEM 177. Only one of CHEM 163L, CHEM 167L, and CHEM 177N may count toward graduation.

**CHEM 178: General Chemistry II**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 163 or CHEM 167 or (CHEM 177; CHEM 177L)*

Continuation of 177. Recommended for physical or biological science majors, chemical engineering majors, and all others intending to take 300-level chemistry courses.

**CHEM 178L: Laboratory in College Chemistry II**

(0-3) Cr. 1. F.S.SS.

*Prereq: CHEM 177L; credit or concurrent enrollment in CHEM 178*

Laboratory to accompany 178. 178L is not a necessary co-requisite with 178.

**CHEM 201: Advanced General Chemistry**

(5-0) Cr. 5. F.

*Prereq: Credit or concurrent enrollment in MATH 165 or MATH 166 or MATH 265; concurrent enrollment in CHEM 201L*

A one-semester course in general chemistry designed to give students an in-depth, broad-based view of modern chemistry, and, in part, to facilitate participation in independent undergraduate research. Topics include stoichiometry, atomic and molecular structure, chemical bonding, kinetics, chemical equilibria, and thermodynamics. Discussion of current trends in various chemical disciplines, which may be given by guest experts in chemistry, biochemistry, and chemical engineering, will help the student appreciate the scope of the chemical sciences and how research is carried out. One year HS chemistry and one year HS physics, or advanced chemistry necessary. Only one of CHEM 163, 167, 177, or 201 may count toward graduation.

**CHEM 201L: Laboratory in Advanced General Chemistry**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in CHEM 201*

Laboratory to accompany 201. Introductory lab experience in synthesis and analysis to prepare students for research activities. 201L must be taken with 201. Only one of 163L, 167L, 177L, 177N or 201L may count toward graduation.

**CHEM 211: Quantitative and Environmental Analysis**

(2-0) Cr. 2. F.S.

*Prereq: (CHEM 163; CHEM 163L; CHEM 178; CHEM 201; CHEM 201L); concurrent enrollment in CHEM 211L*

Theory and practice of elementary volumetric, chromatographic, electrochemical and spectrometric methods of analysis. Chemical equilibrium, sampling, and data evaluation. Emphasis on environmental analytical chemistry; the same methods are widely used in biological and materials sciences as well.

**CHEM 211L: Quantitative and Environmental Analysis Laboratory**

(0-6) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in CHEM 211*

Introductory laboratory experience in volumetric, spectrometric, electrochemical and chromatographic methods of chemical analysis.

**CHEM 231: Elementary Organic Chemistry**

(3-0) Cr. 3. F.S.SS.

*Prereq: (CHEM 163; CHEM 163L) or (CHEM 177; CHEM 177L) or CHEM 167; credit or concurrent enrollment in CHEM 231L*

A survey of modern organic chemistry including nomenclature, structure and bonding, and reactions of hydrocarbons and important classes of natural and synthetic organic compounds. For students desiring only an elementary course in organic chemistry. Students in physical or biological sciences and premedical or preveterinary curricula should take the full year sequence 331 and 332 (with the accompanying laboratories 331L and 332L). Only one of Chem 231 and 331 or BBMB 221 may count toward graduation.

**CHEM 231L: Laboratory in Elementary Organic Chemistry**

(0-3) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in CHEM 231; (CHEM 163L or CHEM 177L)*

Laboratory to accompany 231. 231L must be taken with 231. Only one of Chem 231L and 331L may count toward graduation.

**CHEM 298: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Sophomore classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**CHEM 299: Undergraduate Research (for Freshmen and Sophomores)**

Cr. arr. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

**CHEM 301: Inorganic Chemistry**

(2-0) Cr. 2. S.

*Prereq: CHEM 324*

Atomic and molecular structure and bonding principles; molecular shapes and symmetry; acids and bases; solid-state structures and properties; inorganic chemistry of H, B, C.

**CHEM 316: Instrumental Methods of Chemical Analysis**

(2-0) Cr. 2. F.

*Prereq: CHEM 211; CHEM 211L; MATH 166; concurrent enrollment in CHEM 316L*

Quantitative and qualitative instrumental analysis. Operational theory of instruments, atomic and molecular absorption and emission spectroscopy, electroanalysis, mass spectrometry, liquid and gas chromatography, electrophoresis, literature of chemical analysis. PHYS 232 recommended.

**CHEM 316L: Instrumental Analysis Laboratory**

(0-6) Cr. 2. F.

*Prereq: Credit or concurrent enrollment in CHEM 316*

Advanced laboratory experience in UV-visible spectrophotometry, atomic absorption and emission spectrometry, electrochemistry, gas and liquid chromatography, electrophoresis, mass spectrometry, and other instrumental methods.

**CHEM 321L: Laboratory in Physical Chemistry**

(1-3) Cr. 2. S.

*Prereq: Credit or concurrent enrollment in CHEM 324 or CHEM 325*

Error analysis; use of computers for interfacing to experiments and for data analysis; thermodynamics, infrared and optical spectroscopy, lasers. Not applicable towards the B.S. degree in Chemistry. Only one of Chem 321L and 322L may count toward graduation.

**CHEM 322L: Laboratory in Physical Chemistry**

(1-6) Cr. 3. S.

*Prereq: CHEM 324 or CHEM 325*

Error analysis; use of computers for interfacing to experiments and for data analysis; thermodynamics, surface science, infrared and optical spectroscopy, lasers. Only one of Chem 321L and 322L may count toward graduation.

**CHEM 324: Introductory Quantum Mechanics**

(3-0) Cr. 3. F.S.

*Prereq: CHEM 178; MATH 166; PHYS 232*

Quantum mechanics, atomic and molecular structure, spectroscopy, kinetic theory of gases, chemical kinetics.

**CHEM 325: Chemical Thermodynamics**

(3-0) Cr. 3. F.S.

*Prereq: CHEM 178; MATH 166; PHYS 232*

Classical thermodynamics 1st, 2nd, and 3rd laws with applications to gases and interfacial systems, multicomponent, multiphase equilibrium of reacting systems, surface chemistry, and electrochemical cells. Students taking a two-semester physical chemistry sequence are advised to take 324 first; in the spring semester, a molecular-based section of this course, stressing statistical thermodynamics, is offered for which knowledge of 324 is useful.

**CHEM 326: Chemical Kinetics**

Cr. 1. S.

*Prereq: CHEM 167 or CHEM 177 or CHEM 178 or CHEM 201; MATH 166*

Kinetic theory, rate laws, temperature dependence of rate constants, transition-state theory, reaction mechanisms, kinetic isotope effects, catalysts, Michaelis-Menten kinetics, and Marcus theory. CHEM 324 and CHEM 325 recommended.

**CHEM 331: Organic Chemistry I**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 178 or CHEM 201*

The first half of a two semester sequence. Modern organic chemistry including nomenclature, synthesis, structure and bonding, reaction mechanisms. For students majoring in physical and biological sciences, premedical and pre-veterinary curricula, chemistry and biochemistry. Students desiring only one semester of organic chemistry should take 231 and 231L, not 331. Enrollment in CHEM 331L highly recommended. Only one of Chem 231 and 331 may count toward graduation.

**CHEM 331L: Laboratory in Organic Chemistry I**

(0-3) Cr. 1. F.S.SS.

*Prereq: CHEM 177L; credit or concurrent enrollment in CHEM 331*

Laboratory to accompany 331. Chemistry and biochemistry majors are encouraged to take 333L. Only one of Chem 231L and 331L may count toward graduation.

**CHEM 332: Organic Chemistry II**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 331*

Continuation of 331. Modern organic chemistry including nomenclature, synthesis, structure and bonding, reaction mechanisms, natural products, carbohydrates and proteins. For students majoring in physical and biological sciences, premedical and pre-veterinary curricula, chemistry and biochemistry. Enrollment in CHEM 332L highly recommended.

**CHEM 332L: Laboratory in Organic Chemistry II**

(0-3) Cr. 1. F.S.SS.

*Prereq: CHEM 331L; credit or concurrent enrollment in CHEM 332*

Laboratory to accompany 332. Chemistry and biochemistry majors are encouraged to take 334L.

**CHEM 333L: Laboratory in Organic Chemistry I (for Chemistry and Biochemistry Majors)**

(0-6) Cr. 2. F.

*Prereq: Credit or concurrent enrollment in CHEM 331*

Laboratory to accompany 331 for chemistry and biochemistry majors.

**CHEM 334L: Laboratory in Organic Chemistry II (for Chemistry and Biochemistry Majors)**

(0-6) Cr. 2. S.

*Prereq: CHEM 333L; credit or concurrent enrollment in CHEM 332*

Laboratory to accompany 332 for chemistry and biochemistry majors.

**CHEM 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Junior classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**CHEM 399: Undergraduate Research**

Cr. arr.

*Prereq: Sophomore, Junior, or Senior classification; Permission of Instructor*

A comprehensive research report, describing the work performed, the justification or purpose of the research work, the results obtained, and including appropriate literature references/citations must be submitted to the undergraduate chemistry office and the research faculty member. Reports must contain a title, abstract, introduction, procedural details (experimental, computational, or theoretical), results, discussion, and references. No more than six total credits of Chem 399 and Chem 499 may count toward graduation. Credits earned in 399/499/490 may only be use to meet one of the advanced course requirements for the B.S. degree.

**CHEM 401L: Inorganic Chemistry Laboratory**

(0-3) Cr. 1. S.

*Prereq: CHEM 402*

Preparation and characterization of inorganic and organometallic compounds by modern techniques. For students majoring in chemistry or biochemistry.

**CHEM 402: Advanced Inorganic Chemistry**

(3-0) Cr. 3. F.

*Prereq: CHEM 301*

Chemistry of the d and f metals. Structure, bonding, electronic spectra, and reaction mechanisms. Aspects of organometallic solid state and bioinorganic chemistry. CHEM 331 recommended.

**CHEM 490: Independent Study**

Cr. arr.

*Prereq: 6 credits in CHEM at 300 level or higher; Permission of Instructor*

No more than 9 credits of Chem 490 may count toward graduation.

**CHEM 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Senior classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**CHEM 499: Senior Research**

Cr. 2-3. Repeatable, maximum of 6 credits.

*Prereq: 3.0 GPA in CHEM, PHYS, and MATH courses; Permission of Instructor*

Research in chosen area of chemistry. This course should be elected for two consecutive semesters. For students majoring in chemistry. A comprehensive and formal research report/senior thesis, describing the work performed, the justification or purpose of the research work, the results obtained, and including appropriate literature references/citations must be submitted to the undergraduate chemistry office and the research faculty member. Reports must contain a title, abstract, introduction, procedural details (experimental, computational, or theoretical), results, discussion, and references. No more than six total credits for Chem 399 and 499 may count toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**CHEM 501L: Inorganic Preparations**

(0-3) Cr. 1. F.

*Prereq: CHEM 402*

Preparation and characterization of inorganic and organometallic compounds by modern research techniques.

**CHEM 502: Advanced Inorganic Chemistry**

(3-0) Cr. 3. F.

*Prereq: CHEM 402; CHEM 331 recommended*

Chemistry of the main group (s, p) and transition (d, f) metals. Structure, bonding, electronic spectra, and reaction mechanisms. Aspects of organometallic, solid state, bioinorganic, and nano chemistry.

**CHEM 505: Physical Inorganic Chemistry**

(3-0) Cr. 3. F.

*Prereq: CHEM 402 or CHEM 502 and CHEM 324*

Elementary group theory and molecular orbital theory applied to inorganic chemistry. Spectroscopic methods of characterization of inorganic compounds and organometallic compounds.

**CHEM 511: Advanced Analytical Chemistry**

(3-0) Cr. 3. F.

*Prereq: CHEM 316 and CHEM 316L*

General methods of quantitative inorganic and organic analysis. Aqueous and nonaqueous titrimetry; selective reagents; sampling and sample dissolution; modern instrumentation; sensors; atomic and molecular microscopy; bioanalytical methods; data evaluation; chemometrics; and analytical literature.

**CHEM 512: Electrochemical Methods of Analysis**

(3-0) Cr. 3. F.

*Prereq: CHEM 316 and CHEM 316L; Recommended but not Required CHEM 324, and CHEM 322L*

Principles of convective-diffusional mass transport in electroanalysis. Applications of potentiometry, voltammetry, and coulometry. Introduction to heterogeneous and homogeneous kinetics in electroanalysis. Analog and digital circuitry. Interfacing.

**CHEM 513: Analytical Molecular and Atomic Spectroscopy**

(3-0) Cr. 3. S.

*Prereq: CHEM 316 and CHEM 316L, CHEM 324, CHEM 322L*

Introduction to physical optics and design of photometric instruments. Principles of absorption, emission, fluorescence, and Raman spectroscopy. Error and precision of optical methods. Ultraviolet, visible, and infrared methods of qualitative and quantitative organic and inorganic analysis.

**CHEM 516: Analytical Separations**

(3-0) Cr. 3. F.

*Prereq: CHEM 316 and CHEM 316L, CHEM 324, CHEM 322L*

Principles and examples of inorganic and organic separation methods applied to analytical chemistry. Solvent extraction, volatilization, ion exchange, liquid and gas chromatography, and electrophoresis.

**CHEM 531: Organic Synthesis I**

(3-0) Cr. 3. S.

*Prereq: CHEM 332*

Survey of organic functional group transformations.

**CHEM 532: Organic Synthesis II**

(2-0) Cr. 2. F.

*Prereq: CHEM 531*

Synthesis of complex organic compounds including natural products.

**CHEM 537: Physical Organic Chemistry I**

(3-0) Cr. 3. F.

*Prereq: CHEM 332*

Survey of reactive intermediates including cations, anions, carbenes, and radicals.

**CHEM 538: Physical Organic Chemistry II**

(3-0) Cr. 3. S.

*Prereq: CHEM 537*

Molecular structure, stereochemistry, introduction to reaction mechanisms, thermodynamic and kinetic data, linear free energy relationships, isotope effects, orbital symmetry.

**CHEM 549: Nuclear Magnetic Resonance Spectroscopy**

(Cross-listed with BBMB). (3-0) Cr. 3. S.

*Prereq: any one of the following: CHEM 324, CHEM 325, BBMB 461, BBMB 561*

Theoretical principles of NMR, practical aspects of experimental NMR, solution and solid state NMR, methodologies for molecule characterization, protein structure determination, NMR relaxation, and recent advances.

**CHEM 550: Safety in the Chemical Laboratory**

(1-0) Cr. 1. S.

*Prereq: CHEM 332L*

Introduction to laboratory safety and chemical hygiene. Use of engineering controls and personal protective equipment. Chemical storage and waste disposal practices. Handling hazardous chemicals. Radiation safety and laser safety. Offered on a satisfactory-fail basis only.

**CHEM 555: Teaching College Chemistry**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Graduate or senior classification.*

Methods of instruction, strategies and techniques for effective teaching and learning along with practice teaching in undergraduate chemistry recitation and laboratory courses. Cooperative learning, guided-inquiry, learning cycles, conceptual change, models and modeling, concept maps, visualization, computer simulations, web-based delivery systems, and learning theories.

**CHEM 561: Fundamentals of Quantum Mechanics**

(4-0) Cr. 4. F.

*Prereq: CHEM 324*

Schrodinger equation and exact solutions; square wells and barriers; harmonic oscillator; the hydrogen atom; atomic orbitals; operators including angular momenta; time-independent and time-dependent perturbation theory; Schrodinger and Heisenberg representations; unitary operators; interaction picture, density matrix.

**CHEM 562: Fundamentals of Atomic and Molecular Quantum Mechanics**

(3-0) Cr. 3. S.

*Prereq: CHEM 561, credit or enrollment in CHEM 583*

Variational method, many electron atoms; addition of angular momentum, self-consistent field method for open and closed shells, linear combinations of atomic orbitals, origin of chemical bonding, many-electron diatomic and polyatomic molecules, treatments of electron correlation, approximation methods.

**CHEM 563: Statistical Mechanics**

(3-0) Cr. 3. S.

*Prereq: CHEM 325*

Microscopic and macroscopic properties, laws of thermodynamics, ensembles and distribution functions, applications to gases, solids, and chemical equilibrium.

**CHEM 564: Molecular Spectroscopy and Structure**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: CHEM 505 or CHEM 562*

Maxwell's field equations, interaction of light with matter including time-dependent perturbation theory, microwave, vibrational (infra-red, Raman) and electronic spectroscopies, symmetry derived selection rules, special lineshapes and introduction to nonlinear and coherent laser spectroscopies.

**CHEM 571: Solid-State Chemistry**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: CHEM 301, CHEM 324*

Structural principles, synthetic strategies, analytical methods, and chemical bonding issues applied to solids. Atomic packings and networks, short-range vs. long-range order, defects; phase diagrams, reactive fluxes, chemical transport; diffraction, spectroscopy; energy bands and their bonding interpretations.

**CHEM 572: Spectrometric Identification of Organic Compounds**

(2-3) Cr. 3. F.

*Prereq: CHEM 332*

Principles of infrared, ultraviolet, nuclear magnetic resonance, and mass spectroscopy as applied to organic chemistry.

**CHEM 573: Nanochemistry**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: CHEM 301, CHEM 324*

Synthesis, characterization, properties and applications of nanoscale materials ( $\approx 0.5$ -500 nm), relationship with molecular, meso and bulk compounds. Chemistry of solid surfaces, zero-, one- and two-dimensional (0D, 1D, 2D) nanostructures, semiconductor quantum dots, plasmonic nanoparticles, carbon nanomaterials, porous nanomaterials, potential health and safety impacts.



**CHEM 574: Organometallic Chemistry of the Transition Metals**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: CHEM 301, CHEM 332*

Transition metal complexes with ligands such as cyclopentadienyl, olefins, acetylenes, benzenes, and carbon monoxide. Coverage of structure, bonding, reactivity, fundamental mechanisms, and homogeneous catalysis.

**CHEM 575: Diffraction and Crystal Structure**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: CHEM 324*

Fundamentals of structure determination for single crystals emphasizing symmetry, diffraction geometry and instrumentation, sample preparation and handling, data collection strategies, methods of structure solution and refinement, presentation of results, and crystallographic databases.

**CHEM 576: Surface Chemistry**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: CHEM 324*

Gas-surface interactions and techniques of characterization. Idealized surface lattices, surface tension, Wulff plots, work function, adsorbate-adsorbate interactions, 2D phase diagrams, diffusion, thin film growth, adsorption and desorption mechanisms/energetics/kinetics, adsorption isotherms, vacuum techniques, electron- and ion-based spectroscopies for surface analysis (including AES, FIM, XPS, UPS, EXAFS, EELS, SIMS, LEED and STM).

**CHEM 577: Mass Spectrometry**

(3-0) Cr. 3. S.

Basic physics, instrumentation, chemical and biological applications of mass spectrometry.

**CHEM 578: Chemical Kinetics and Mechanisms**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: CHEM 324*

Rates and mechanisms; reversible, consecutive, and competing reactions; chain mechanisms; kinetic isotope effects; very rapid reactions; acid-base catalysis, theories of unimolecular reactions; transition state and Marcus theories.

**CHEM 579: Introduction to Research in Chemistry**

Cr. R. F.

Introduction to the various areas of research in chemistry at Iowa State University.

**CHEM 580: Introduction to Computational Quantum Chemistry**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: CHEM 324*

Basic principles of quantum mechanics, schrodinger equation. Hartree-Fock/molecular orbital theory, introduction to group theory, introduction to modern methods of computational chemistry; applications include molecular structure, potential energy surfaces and their relation to chemical reactions; molecular spectroscopy, photochemistry, solvent effects and surface chemistry.

**CHEM 583: Chemical Group Theory**

(1-0) Cr. 1. F.

*Prereq: CHEM 324*

Basic concepts and theorems, representation theory; point groups, molecular orbitals, molecular states, molecular vibrations, rotation group and angular momenta; space groups and crystals; permutation group, antisymmetry, and spin states.

**CHEM 599: Nonthesis Research**

Cr. arr.

*Prereq: Permission of instructor concerned***Courses for graduate students:****CHEM 600: Seminar in Inorganic Chemistry**

(1-0) Cr. 1. Repeatable, maximum of 3 times. F.S.

*Prereq: Permission of instructor***CHEM 601: Selected Topics in Inorganic Chemistry**

(2-0) Cr. 1-2. F.S.

*Prereq: Permission of instructor*

Topics such as molecular structure and bonding; organometallic compounds; physical techniques of structure determination; nonaqueous solutions; Zintl phases; transition-metal oxides; free-radical reactions; electron transfer reactions; metal-metal bonding; and bioinorganic chemistry of nucleic acids.

**CHEM 611: Seminar in Analytical Chemistry**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor***CHEM 619: Special Topics in Analytical Chemistry**

(2-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of instructor*

Raman spectroscopy, sensors, spectroelectrochemistry, capillary electrophoresis, analytical plasmas, chemometrics and bioanalytical chemistry.

**CHEM 631: Seminar in Organic Chemistry**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor*

**CHEM 632: Selected Topics in Organic Chemistry**

(2-0) Cr. 1-2. Repeatable. F.S.

*Prereq: CHEM 537*

Topics of current interest in organic chemistry such as spectroscopy, physical organic chemistry, photochemistry, organometallic chemistry, mechanisms of oxidations and reductions, modern organic synthesis, reactive intermediates, bioorganic chemistry, and polymers.

**CHEM 660: Seminar in Physical Chemistry**

(1-0) Cr. 1. Repeatable. S.

*Prereq: Permission of instructor*

**CHEM 667: Special Topics in Physical Chemistry**

(2-0) Cr. 1-2. F.S.

*Prereq: Permission of instructor*

Advanced and recent developments in physical chemistry are selected for each offering.

**CHEM 699: Research**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

## Chinese (CHIN)

**Any experimental courses offered by CHIN can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**CHIN 101: Elementary Mandarin Chinese I**

(4-0) Cr. 4. F.

Introduction to spoken and written colloquial Mandarin through pinyin and simplified characters. For students whose native language is not Chinese.

**CHIN 102: Elementary Mandarin Chinese II**

(4-0) Cr. 4. S.

*Prereq: CHIN 101*

Introduction to spoken and written colloquial Mandarin through pinyin and simplified characters. For students whose native language is not Chinese.

Meets International Perspectives Requirement.

**CHIN 201: Intermediate Mandarin Chinese I**

(4-0) Cr. 4. F.

*Prereq: CHIN 102*

Development of speaking, writing, reading, and listening skills. Review and expansion of grammar skills, intensification of character acquisition. For students whose native language is not Chinese. Meets International Perspectives Requirement.

**CHIN 202: Intermediate Mandarin Chinese II**

(4-0) Cr. 4. S.

*Prereq: CHIN 201*

Development of speaking, writing, reading, and listening skills. Review and expansion of grammar skills, intensification of character acquisition. For students whose native language is not Chinese. Meets International Perspectives Requirement.

**CHIN 301: Advanced Mandarin Chinese I**

(3-0) Cr. 3. F.

*Prereq: CHIN 202*

Continuing development of speaking, writing, reading, and listening skills beyond intermediate level. Expansion of cultural literacy through a variety of texts from the humanities, social sciences, mass media and business. Native speakers of Chinese by instructor's permission only. Meets International Perspectives Requirement.

**CHIN 302: Advanced Mandarin Chinese II**

(3-0) Cr. 3. S.

*Prereq: CHIN 301*

Continuing development of speaking, writing, reading, and listening skills beyond intermediate level. Expansion of cultural literacy through a variety of texts from the humanities, social sciences, mass media and business. Native speakers of Chinese by instructor's permission only. Meets International Perspectives Requirement.

**CHIN 304: Chinese for Global Professionals**

(4-0) Cr. 4. S.

*Prereq: CHIN 202*

Introduction to professional language and culture in China and Chinese-speaking regions in Asia. Development of all four language skills, focusing on practical applications in the professional contexts. Development of global awareness and cross-cultural understanding. Preparation for internships. Meets International Perspectives Requirement.

**CHIN 370: Chinese Literature in English Translation**

(3-0) Cr. 3. Repeatable. F.

*Prereq: ENGL 150*

Topics may include traditional prose, poetry, novel and drama; twentieth-century fiction and film. All readings and class discussions in English. Meets International Perspectives Requirement.

**CHIN 372: Introduction to Chinese Culture**

(3-0) Cr. 3. S.

Interdisciplinary introduction to Chinese society and culture from earliest times to the present. Topics include ancient literature, philosophy, religion, art, architecture, customs, transition to a modern society, social changes, urban life, popular culture, and contemporary values and ideas. Meets International Perspectives Requirement.

**CHIN 375: China Today**

(3-2) Cr. 3-4. Repeatable. S.

*Prereq: ENGL 250*

Focusing on contemporary society, culture, literature and the arts. All readings, discussions, and papers in English. Topics vary from year to year.

Meets International Perspectives Requirement.

**CHIN 378: Chinese Film and Society**

Cr. 3. S.

*Prereq: ENGL 150*

Survey of Chinese cinematic history from 1896 to the present against the background of China's constant sociocultural transformation; emphasis on narrative themes, film history, and film criticism. Topics vary according to faculty interest. Taught in English.

Meets International Perspectives Requirement.

**CHIN 403: Seminar in Chinese Language and Culture**

(3-0) Cr. 3.

*Prereq: CHIN 302*

Critical understanding of authentic texts at the advanced level through reading, translation, and/or application in professional contexts; consolidation of existing language skills, in-depth analysis of cultural issues, and development of professional language proficiency. Taught in Chinese.

Meets International Perspectives Requirement.

**CHIN 403A: Seminar in Chinese Language and Culture: Translating Contemporary Chinese Texts**

(3-0) Cr. 3.

*Prereq: CHIN 302*

Critical understanding of authentic texts at the advanced level through reading, translation, and/or application in professional contexts; consolidation of existing language skills, in-depth analysis of cultural issues, and development of professional language proficiency. Taught in Chinese.

Meets International Perspectives Requirement.

**CHIN 403B: Seminar in Chinese Language and Culture: Topics on Business and Professions**

(3-0) Cr. 3.

*Prereq: CHIN 302*

Critical understanding of authentic texts at the advanced level through reading, translation, and/or application in professional contexts; consolidation of existing language skills, in-depth analysis of cultural issues, and development of professional language proficiency. Taught in Chinese.

Meets International Perspectives Requirement.

**CHIN 403C: Seminar in Chinese Language and Culture: Reading Chinese Texts**

(3-0) Cr. 3.

*Prereq: CHIN 302*

Critical understanding of authentic texts at the advanced level through reading, translation, and/or application in professional contexts; consolidation of existing language skills, in-depth analysis of cultural issues, and development of professional language proficiency. Taught in Chinese.

Meets International Perspectives Requirement.

**CHIN 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: 6 credits in CHIN; Permission of Department Chair*

Designed to meet student needs in areas beyond current course offerings or to accommodate the desire to integrate a study of literature or language with special issues in major fields.

**CHIN 499: Internship in Chinese**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 9 credits of CHIN at the 300-level; Permission of Department*

Work experience using Chinese in the public or private sector, combined with academic work under faculty supervision. Offered on a satisfactory-fail basis only. No more than 3 credits may apply toward the Chinese minor or LCP minor.

## Civil Engineering (C E)

***Any experimental courses offered by C E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**C E 111: Geomatics**

(2-3) Cr. 3. F.S.

*Prereq: C E 160; C E 170; MATH 165*

Fundamentals of geospatial measurement theory, computations, analysis, and instrumentation relative to engineering surveys. Includes distance and angular measurement and analyses; elevation, area, and volume determinations; construction staking; errors in observations; traversing; horizontal and vertical curve layout; geographical information systems; and equipment used for measurements.

**C E 120: Civil Engineering Learning Community**

(1-0) Cr. 1. F.S.

Integration of first-year students into the Civil Engineering program. Assignments and activities involving teamwork, academic preparation, study skills, and preparation for entry into the Civil Engineering profession. Completed both individually and in learning teams under the direction of faculty and peer mentors.

**C E 160: Engineering Problems with Computational Laboratory**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 165*

Engineering approach to solving problems and presenting results with applications to examples in civil, construction, and environmental engineering, such as problems in statics. Dimensions and units. Data processing, graphing, and curve fitting. Formulating and solving fundamental and practical engineering problems with spreadsheets and a structured programming language. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**C E 170: Graphics for Civil Engineering**

(0-4) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143 or MATH 145 (or satisfactory scores on mathematics placement assessments)*

Integration of fundamental graphics, computer modeling, and engineering design. Applications of multiview drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process. Freehand and computer methods. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**C E 190: Introduction to Undergraduate Research in Civil and Environmental Engineering**

(Cross-listed with ENV E). Cr. 2. Repeatable, maximum of 4 times.

*Prereq: Permission of Instructor*

Introduction to research, focusing on sub-disciplines of civil and environmental engineering. Research questions, hypotheses, literature reviews, experimental design, data collection, data analysis, and presentation. Topics chosen to introduce students to water resources, environmental engineering, transportation engineering, geotechnical/materials engineering, or structural engineering. Repeatable but only two credits may count toward graduation in C E

**C E 206: Engineering Economic Analysis and Professional Issues in Civil Engineering**

(3-0) Cr. 3. F.S.

*Prereq: (C E 120 or CON E 121 or CON E 122 or ENGR 131 or ENV E 120); ENGL 250; MATH 166*

Engineering/managerial analysis of the economic aspects of project proposals. Alternative sources of funds; time value of money; expenditure of capital funds and methods of evaluating alternative projects. Professionalism, licensure, liability, ethics, leadership, risk analysis, social responsibility, creative and critical thinking, and applications/impacts of regulations in civil engineering. ECON 101 recommended.

**C E 274: Engineering Statics**

(3-0) Cr. 3. F.S.SS.

*Prereq: Credit or concurrent enrollment in MATH 166; PHYS 231; PHYS 231L*

Vector analysis; analysis of force systems; resultant in two and three dimensions; free-body diagrams; equilibrium; analysis of trusses, frames, and machines; friction, belts and pulleys; shear and bending moment in beams, centroid and center of mass; second moments of areas.

**C E 306: Project Management for Civil Engineers**

(2-3) Cr. 3. F.S.

*Prereq: (C E 120 or ENV E 120); (C E 170 or ENV E 190)*

Project management, including work breakdown structures, cost estimating, scheduling, and project control. Civil engineering project life cycle, including planning, design, construction, and maintenance processes. Techniques in interpretation of contract documents, plan reading, and in estimating quantities.

**C E 326: Principles of Environmental Engineering**

(Cross-listed with ENV E). (2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in A B E 378; (CHEM 167 or CHEM 177); CHEM 178; MATH 166*

Introduction to environmental problems, water quality indicators and requirements, potable water quality and quantity objectives, water sources and treatment methods; water pollution control objectives and treatment methods; survey of solid and hazardous waste management and air pollution control.

**C E 332: Structural Analysis I**

(2-2) Cr. 3. F.S.

*Prereq: E M 324*

Loads, shear, moment, and deflected shape diagrams for beams and framed structures. Deformation calculations. Approximate methods. Application of consistent deformation methods to continuous beams and frames. Application of displacement or slope deflection methods to continuous beams and frames without sway. Influence lines for determinate and indeterminate structures. Computer applications to analyze beams and frames. Validation of computer results.

**C E 333: Structural Steel Design I**

(3-1) Cr. 3. F.S.

*Prereq: C E 332; E M 327*

AISC design methods for structural steel buildings. Design of steel tension members. Design of steel members for flexure. Design of members for compression. Beam-Column member design. Introduction to steel building systems. Steel moment frames and concentrically braced frames. Design of commonly used connections in steel buildings.

**C E 334: Reinforced Concrete Design I**

(2-2) Cr. 3. F.S.

*Prereq: C E 332; E M 327*

ACI design methods for structural concrete members. Emphasis on the analysis and design for flexure of singly reinforced and doubly reinforced sections, T-section, one-way slabs, short columns, and isolated footings. Analysis and design for shear, and serviceability. Bond, anchorage, and development of reinforcement.

**C E 355: Principles of Transportation Engineering**

(3-0) Cr. 3. F.S.

*Prereq: C E 111*

Introduction to planning, design, and operations of transportation facilities. Road user, vehicle and roadway characteristics. Technological, economic and environmental factors. Asset management, transportation planning, capacity analysis, traffic control, geometric design, traffic safety.

**C E 360: Geotechnical Engineering**

(3-3) Cr. 4. F.S.

*Prereq: E M 324; credit or concurrent enrollment in (CON E 241 or GEOL 201)*

Introduction to geotechnical engineering and testing. Identification and classification tests, soil water systems, principles of settlement, stresses in soils, and shear strength testing; slope stability, retaining walls, bearing capacity.

**C E 372: Engineering Hydrology and Hydraulics**

(3-0) Cr. 3. F.S.

*Prereq: A B E 378; (STAT 231 or STAT 305)*

The hydrologic cycle: precipitation, infiltration, runoff, evapotranspiration, groundwater, and streamflow. Hydrograph analysis, flood routing, frequency analysis and urban hydrology. Applied hydraulics including pipe and channel flow with design applications in culverts, pumping, water distribution, storm and sanitary sewer systems. Design project required.

**C E 382: Design of Concretes**

(2-3) Cr. 3. F.S.

*Prereq: C E 274*

Physical and chemical properties of bituminous, portland, and other cements; aggregate properties and blending; mix design and testing of concretes; admixtures, mixing, handling, placing and curing; principles of pavement thickness design.

**C E 383: Design of Portland Cement Concrete**

(0-2) Cr. 1. F.S.

*Prereq: C E 274*

For Con E students only. Physical and chemical properties of portland cement and p.c. concrete. Mix design and testing of p.c. concrete. Credit for both C E 382 and C E 383 may not be applied for graduation.

**C E 388: Sustainable Engineering and International Development**

(Cross-listed with A B E, E E). (2-2) Cr. 3. F.

*Prereq: Junior classification in an Engineering Major*

Multi-disciplinary approach to sustainable engineering and international development, sustainable development, appropriate design and engineering, feasibility analysis, international aid, business development, philosophy and politics of technology, and ethics in engineering. Engineering-based projects from problem formulation through implementation. Interactions with partner community organizations or international partners such as nongovernment organizations (NGOs). Course readings, final project/design report. Meets International Perspectives Requirement.

**C E 395: Global Perspectives in Transportation**

Cr. 3. Repeatable, maximum of 2 times. S.

Background on historical civil engineering design and construction. Impacts of historical, cultural, social, economic, ethical, environmental, and political conditions on the design and construction of various infrastructure projects outside the United States. Global road safety and intermodal operations. Addressing transportation problems in a large metropolitan area. Meets International Perspectives Requirement.

**C E 403: Program and Outcome Assessment**

Cr. R. F.S.

Assessment of C E Curriculum and educational objectives. Assessments to be reviewed by the CE Department to incorporate potential improvements. Verification of undergraduate application for graduation by the end of the first week of class. Permission of instructor for students who are scheduled for summer graduation. Offered on a satisfactory-fail basis only.

**C E 413: Applied and Environmental Geophysics**

(Dual-listed with C E 513). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**C E 417: Boundary Surveys**

(2-3) Cr. 3. S.

*Prereq: C E 111*

Basic principles of boundary surveying with a focus on the legal principles affecting the determination of land boundaries. Concepts include boundaries, ownership, boundary law principles, easements, sequential and simultaneous conveyances, case studies, riparian rights, state laws and rules for practicing surveying, American Land Title Association (ALTA) surveys and standards, U.S. public land survey system; unwritten land transfers; plats of survey; land descriptions and boundary evidence.

**C E 420: Environmental Engineering Chemistry**

(Dual-listed with C E 520). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: C E 326; CHEM 178*

Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters; including chemical equilibria, reaction kinetics, acid-base equilibria, chemical precipitation, redox reactions, and mass transfer principles. Individual laboratory practicals and group projects required.

**C E 424: Air Pollution**

(Dual-listed with C E 524). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 424A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with C E 524A). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 424B: Air Pollution: Climate change and causes**

(Dual-listed with C E 524B). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 424C: Air Pollution: Transportation Air Quality**

(Dual-listed with C E 524C). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A***C E 424D: Air Pollution: Off-gas treatment technology**

(Dual-listed with C E 524D). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B***C E 424E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with C E 524E). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 428: Water and Wastewater Treatment Plant Design**

(Cross-listed with ENV E). (3-0) Cr. 3. S.

*Prereq: C E 326*

Physical, chemical and biological processes for the treatment of water and wastewater including coagulation and flocculation, sedimentation, filtration, adsorption, chemical oxidation/disinfection, fixed film and suspended growth biological processes and sludge management. Design project.

**C E 439: Seismic Methods in Geology, Engineering, and Petroleum Exploration**

(Dual-listed with C E 539). (Cross-listed with GEOL). (2-2) Cr. 3. Alt. S.,

offered even-numbered years.

Physics of elastic-wave propagation. Seismic surveys in environmental imaging, engineering, and petroleum exploration. Reflection and refraction techniques. Data collection, processing, and geological interpretation. Field work with state-of-the-art equipment. Introductory geology, algebra, and trigonometry recommended.

**C E 446: Bridge Design**

(Dual-listed with C E 546). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: C E 333; C E 334*

Bridge design in structural steel and reinforced concrete. Application of AASHTO Bridge Design Specifications. Analysis techniques for complex structures. Preliminary designs include investigating alternative structural systems and materials. Final designs include preparation of design calculations and sketches. Design project.



**C E 448: Building Design**

(Dual-listed with C E 548). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: C E 333; C E 334*

Building design in structural steel and reinforced concrete. Investigation of structural behavior. Gravity and lateral load resisting systems. Application of current building codes and design specifications. In-depth analysis of gravity and wind loads on buildings. Review of building designs. Preliminary designs include investigating alternative structural systems. Approximate methods of structural analysis for gravity and lateral loads. Final designs include preparation of design calculations and sketches. Design project.

**C E 449: Structural Health Monitoring**

(Dual-listed with C E 549). (3-0) Cr. 3.

*Prereq: Senior classification in an Engineering major or Permission of Instructor*

Introductory and advanced topics in structural health monitoring (SHM) of aeronautical, civil, and mechanical systems. Topics include sensors, signal processing in time and frequency domains, data acquisition and transmission systems, design of integrated SHM solutions, nondestructive evaluation techniques, feature extraction methods, and cutting-edge research in the field of SHM. Graduate students will have a supervisory role to assist students in 449 and an additional design project or more in-depth analysis and design.

**C E 451: Urban Transportation Planning Models**

(Dual-listed with C E 551). (3-0) Cr. 3. F.

*Prereq: C E 355; (STAT 231 or STAT 305)*

Urban transportation planning context and process. Project planning and programming. Congestion, mitigation, and air quality issues. Transportation data sources. Travel demand and network modeling. Use of popular travel demand software and applications of geographic information systems.

**C E 453: Highway Design**

(2-2) Cr. 3. F.

*Prereq: C E 306; C E 355*

Introduction to highway planning and design. Design, construction, and maintenance of highway facilities. Level-of-service, stopping sight distance, highway alignment, earthwork and pavement design. Design project, oral reports and written reports. Computer applications.

**C E 460: Foundation Engineering**

(3-0) Cr. 3. F.S.

*Prereq: C E 360*

Fundamentals of foundation engineering. Exploration, sampling, and in-situ tests. Shallow and deep foundations. Settlement and bearing capacity analyses. Stability of excavations and earth retaining structures. Design project.

**C E 462: Site Evaluations for Civil Engineering Projects**

(Dual-listed with C E 562). (2-3) Cr. 3.

*Prereq: C E 360 or Permission of Instructor*

Identification and mapping of engineering soils from aerial photos, maps, and soil surveys. Planning subsurface investigations, geomaterials prospecting, geotechnical hazards, geomorphology, in situ testing and sampling, geophysical site characterization, instrumentation and monitoring, interpretation of engineering parameter values for design.

**C E 467: Geomaterials Stabilization**

(Dual-listed with C E 567). (2-2) Cr. 3.

*Prereq: (C E 360; [C E 382 or C E 383]) or Permission of Instructor*

Soil and aggregate physical, chemical and biological stabilization procedures. Stabilization analysis and design. Ground modification and compaction methods. Geosynthetics application and design.

**C E 473: Groundwater Hydrology**

(Dual-listed with C E 573). (3-0) Cr. 3. F.

*Prereq: C E 372*

Principles of groundwater flow, hydraulics of wells, superposition, slug and pumping tests, streamlines and flownets, and regional groundwater flow. Contaminant transport. Computer modeling. Design project. Extra assignments required for graduate students.

**C E 483: Pavement Analysis and Design**

(Dual-listed with C E 583). (3-0) Cr. 3. S.

*Prereq: C E 360; C E 382*

Analysis, behavior, performance, and structural design of pavement systems. Topics include climate factors, rehabilitation, life cycle design economics, material and system response, pavement foundations and traffic loadings. Development of models for and analysis of pavement systems. Use of transfer functions relating pavement response to pavement performance. Evaluation and application of current and evolving pavement design practices and procedures. Mechanistic-based pavement design techniques and concepts. Analysis of the effects of maintenance activities on pavement performance and economic evaluation of pavement systems. Design project.

**C E 484: Advanced Design of Concretes**

(Dual-listed with C E 584). (2-3) Cr. 3.

*Prereq: C E 382*

Asphalt binder characterization, fundamentals of asphalt rheology, asphalt materials behavior under loading and temperature effects. High-strength, lightweight, fiber-reinforced, and self-consolidating portland cement concretes, mix design, properties, advanced performance testing. Design project.

**C E 485: Civil Engineering Design**

(2-2) Cr. 3. F.S.

*Prereq:* C E 206; C E 306; C E 326; (C E 333 or C E 334); C E 355; C E 360; C E 372; C E 382; SP CM 212

The civil engineering design process, interacting with the client, identification of the engineering problems, development of a technical proposal, identification of design criteria, cost estimating, planning and scheduling, codes and standards, development of feasible alternatives, selection of best alternative, and oral presentation. Course enrollment limited to final graduating semester.

**C E 488: Sustainable Civil Infrastructure Systems**

(Dual-listed with C E 588). (3-0) Cr. 3. F.

*Prereq:* Permission of Instructor

Sustainable planning, life cycle analysis, appropriate engineering design, investment levels and overall rating of civil engineering infrastructure systems, including highway, bridge, airport, rail, dam, power and port facilities. Complementary assessment of future civil infrastructure sustainability impacts and challenges in relation to autonomous and electric vehicle development. Overview regarding US and global availability and supply of critical infrastructure commodities (e.g., cement, stone, metals, phosphorus, uranium, etc.). Directed course readings and multiple project/design reports.

**C E 489: Pavement Preservation and Rehabilitation**

(Dual-listed with C E 589). Cr. 3. F.S.

*Prereq:* C E 382

Overview of pavement preservation and pavement rehabilitation techniques. Overview and selection of materials used in pavement preservation and rehabilitation strategies. Evaluating suitability of pavement preservation and pavement rehabilitation strategies based on existing structure, pavement distresses and non-condition factors. Use of recycled pavement materials in pavement reconstruction techniques.

**C E 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* Permission of Instructor

Independent study in any phase of civil engineering. Pre-enrollment contract required. No more than 6 credits of C E 490 may be counted towards engineering topics electives.

**C E 490H: Independent Study: Honors**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* Permission of Instructor

Independent study in any phase of civil engineering. Pre-enrollment contract required. No more than 6 credits of C E 490H may be counted towards engineering topics electives.

**Courses primarily for graduate students, open to qualified undergraduates:**

**C E 501: Preconstruction Project Engineering and Management**

(3-0) Cr. 3.

*Prereq:* Credit or enrollment in CON E 422 or C E 306 or graduate standing

Application of engineering and management control techniques to construction project development from conceptualization to notice to proceed. Emphasis is on managing complex projects using 5-dimensional project management theory.

**C E 502: Construction Project Engineering and Management**

(3-0) Cr. 3.

*Prereq:* Credit or enrollment in CON E 422 or C E 594A or permission of instructor

Application of engineering and management control techniques to complex construction projects. Construction project control techniques, project administration, construction process simulation, quality management, and productivity improvement programs.

**C E 503: Construction Finance and Business Management**

(3-0) Cr. 3.

*Prereq:* Credit or enrollment in CON E 422 or C E 594A or permission of instructor

Fundamental theories and applied methods for financial management of construction projects and companies. Construction accounting, cash flow analysis, financial planning and management, and risk analysis. Case studies.

**C E 505: Design of Construction Systems**

(3-0) Cr. 3.

*Prereq:* C E 333, C E 360, CON E 322, CON E 340; or graduate standing

Advanced design of concrete formwork and falsework systems. Design for excavation and marine construction including temporary retaining structures and cofferdams. Aggregate production operations, including blasting, crushing, and conveying systems. Rigging system design.

**C E 506: Case Histories in Construction Documents**

(3-0) Cr. 3.

*Prereq:* Graduate standing or permission of instructor

Study of cases involving disputes, claims, and responsibilities encountered by management in construction contract documents. Analysis of methods of resolving differences among the owner, architect, engineer, and construction contractor for a project.

**C E 510: Information Technologies for Construction**

(3-0) Cr. 3.

*Prereq:* Graduate standing or permission of instructor

Information technologies including microcomputer based systems, management information systems, automation technologies, computer-aided design, and expert systems and their application in the construction industry. Overview of systems acquisition, communications, and networking.

**C E 513: Applied and Environmental Geophysics**

(Dual-listed with C E 413). (Cross-listed with ENSCI, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**C E 520: Environmental Engineering Chemistry**

(Dual-listed with C E 420). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: C E 326; CHEM 178*

Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters; including chemical equilibria, reaction kinetics, acid-base equilibria, chemical precipitation, redox reactions, and mass transfer principles. Individual laboratory practicals and group projects required.

**C E 521: Environmental Biotechnology**

(Cross-listed with ENSCI). (2-2) Cr. 3. F.

*Prereq: C E 326*

Fundamentals of biochemical and microbial processes applied to environmental engineering processes, role of microorganisms in wastewater treatment and bioremediation, bioenergetics and kinetics, metabolism of xenobiotic compounds, waterborne pathogens and parasites, and disinfection. Term paper and oral presentation.

**C E 522: Water Pollution Control Processes**

(Cross-listed with ENSCI). (2-2) Cr. 3.

*Prereq: C E 421 or C E 521*

Fundamentals of biochemical processes, aerobic growth in a single CSTR, multiple events in complex systems, and techniques for evaluating kinetic parameters; unit processes of activated sludge system, attached growth systems, stabilization and aerated lagoon systems, biosolids digestion and disposal, nutrient removal, and anaerobic treatment systems.

**C E 523: Physical-Chemical Treatment Process**

(Cross-listed with ENSCI). (2-2) Cr. 3.

*Prereq: C E 520*

Mass balances. Principles and design of physical-chemical unit processes including ideal and realistic reactors; heterogeneous process including gas transfer, sorption, precipitation, and dissolution; redox; flocculation/coagulation; gravity separations; filtration; and membrane processes, electrodialysis, fouling, and scaling. Emphasis on water and wastewater treatment for environmental, health, and aesthetic ends. Case studies in secondary industries.

**C E 524: Air Pollution**

(Dual-listed with C E 424). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 524A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with C E 424A). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 524B: Air Pollution: Climate change and causes**

(Dual-listed with C E 424B). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 524C: Air Pollution: Transportation Air Quality**

(Dual-listed with C E 424C). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A*

**C E 524D: Air Pollution: Off-gas treatment technology**

(Dual-listed with C E 424D). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B*

**C E 524E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with C E 424E). (Cross-listed with A B E, ENSCI). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**C E 528: Solid and Hazardous Waste Management**

(Cross-listed with ENSCI). (3-0) Cr. 3.

*Prereq: C E 326 or background courses in both environmental chemistry and microbiology; junior or higher standing*

Evaluation, characterization, assessment, planning and design of solid and hazardous waste management systems, regulatory requirements, material characterization and collection, minimization and recycling, energy and materials recovery, composting, off-gas treatment, incineration, stabilization, and landfill design. Design of treatment and disposal systems, including physical, chemical, and biological treatment, solidification, incineration, secure landfill design, and final disposal site closure plus restoration.

**C E 532: Structural Analysis II**

(3-0) Cr. 3. F.

*Prereq: C E 332*

Analysis of indeterminate structural problems by the consistent deformation and generalized direct displacement methods. Direct stiffness method for 2-D frames, grids, 3-D frames. Special topics for the stiffness method.

**C E 533: Structural Steel Design II**

(3-0) Cr. 3.

*Prereq: C E 333*

Theoretical background and development of AISC Specification equations. In-depth analysis and design of tension members, columns, beams, beam-columns, and plate girders. Emphasis on Load and Resistance Factor Design. Elastic and inelastic buckling of members and member elements. Investigation of amplification factors for members subject to combined bending and axial load and to combined bending and torsion. Effective Length Method and Direct Analysis Method of design. Approximate Second-Order Analysis. Biaxial bending. Torsion and combined bending and torsion of W-shapes.

**C E 534: Reinforced Concrete Design II**

(2-2) Cr. 3.

*Prereq: C E 334*

Advanced topics in reinforced concrete analysis and design. Moment-curvature and load-deflection behavior. Design of reinforced concrete long columns, two-way floor slabs, and isolated and combined footings. Design and behavior considerations for torsion, biaxial bending, and structural joints. Strut-and-tie modeling.

**C E 535: Prestressed Concrete Structures**

(3-0) Cr. 3.

*Prereq: C E 334*

Design of prestressed concrete structures, review of hardware, stress calculations, prestress losses, section proportioning, flexural design, shear design, deflections, and statically indeterminate structures.

**C E 539: Seismic Methods in Geology, Engineering, and Petroleum Exploration**

(Dual-listed with C E 439). (Cross-listed with GEOL). (2-2) Cr. 3. Alt. S., offered even-numbered years.

Physics of elastic-wave propagation. Seismic surveys in environmental imaging, engineering, and petroleum exploration. Reflection and refraction techniques. Data collection, processing, and geological interpretation. Field work with state-of-the-art equipment. Introductory geology, algebra, and trigonometry recommended.

**C E 541: Dynamic Analysis of Structures**

(3-0) Cr. 3.

*Prereq: E M 345 and credit or enrollment in C E 532*

Single and multi-degree-of-freedom systems. Free and forced vibrations. Linear and nonlinear response. Modal analysis. Response spectra. Seismic analysis.

**C E 542: Structural Analysis by Finite Elements**

(3-0) Cr. 3.

*Prereq: C E 532 or permission of instructor*

Use of the finite element method for the analysis of complex structural configurations. Plane stress, solid, Axisymmetric and plate elements. Numerical integration. Use of general purpose finite element programs.

**C E 545: Seismic Design**

(3-0) Cr. 3.

*Prereq: C E 333, C E 334*

Seismic hazard in the United States. Engineering characteristics of ground motions. Structural damage in past earthquakes. Capacity design philosophy for seismic resistant design. Conceptual design of structures. Capacity design process including design of structural members.

**C E 546: Bridge Design**

(Dual-listed with C E 446). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: C E 333; C E 334*

Bridge design in structural steel and reinforced concrete. Application of AASHTO Bridge Design Specifications. Analysis techniques for complex structures. Preliminary designs include investigating alternative structural systems and materials. Final designs include preparation of design calculations and sketches. Design project.

**C E 548: Building Design**

(Dual-listed with C E 448). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: C E 333; C E 334*

Building design in structural steel and reinforced concrete. Investigation of structural behavior. Gravity and lateral load resisting systems. Application of current building codes and design specifications. In-depth analysis of gravity and wind loads on buildings. Review of building designs. Preliminary designs include investigating alternative structural systems. Approximate methods of structural analysis for gravity and lateral loads. Final designs include preparation of design calculations and sketches. Design project.

**C E 549: Structural Health Monitoring**

(Dual-listed with C E 449). (3-0) Cr. 3.

*Prereq: Senior classification in an Engineering major or Permission of Instructor*

Introductory and advanced topics in structural health monitoring (SHM) of aeronautical, civil, and mechanical systems. Topics include sensors, signal processing in time and frequency domains, data acquisition and transmission systems, design of integrated SHM solutions, nondestructive evaluation techniques, feature extraction methods, and cutting-edge research in the field of SHM. Graduate students will have a supervisory role to assist students in 449 and an additional design project or more in-depth analysis and design.

**C E 551: Urban Transportation Planning Models**

(Dual-listed with C E 451). (3-0) Cr. 3. F.

*Prereq: C E 355; (STAT 231 or STAT 305)*

Urban transportation planning context and process. Project planning and programming. Congestion, mitigation, and air quality issues. Transportation data sources. Travel demand and network modeling. Use of popular travel demand software and applications of geographic information systems.

**C E 552: Traffic Safety, Operations, and Maintenance**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: C E 355*

Engineering aspects and fundamental principles of transportation safety. Reduction of crash incidence and severity through highway design and traffic control, and maintenance activities. Safety management best practices, safe systems, and other state-of-the-art practices in transportation safety. Human behaviors and how to influence them using engineering countermeasures to improve safety outcome metrics.

**C E 553: Traffic Engineering**

(3-0) Cr. 3. F.

*Prereq: C E 355*

Driver, pedestrian, and vehicular characteristics. Traffic characteristics; highway capacity; traffic studies and analyses. Principles of traffic control for improved highway traffic service. Application of appropriate computing software and tools.

**C E 556: Transportation Data Analysis**

(3-0) Cr. 3.

*Prereq: C E 355, a Statistics course at the 300 level or higher*

Statistical, econometric, and data science principles applied to real-world transportation data. Includes identification of data sources and limitations. Fundamentals of reproducibility and replicability, validation (including spatial and temporal validation), differences and purposes of inferential, descriptive, predictive, causal models, etc. Linear regression, count regression, and discrete choice models. Basic utility theory and decision making with applications in transportation. Emphasis is placed on practical applications, proper model development, assumption checking, and usability of results.

**C E 557: Transportation Systems Analysis**

(3-0) Cr. 3.

*Prereq: C E 355, 3 credits in statistics or probability*

Travel studies and analysis of data. Transportation systems forecasts and analyses. Statewide, regional, and local transportation system planning. Network level systems planning and operations. Optimization of systems.

**C E 558: Transportation Systems Development and Management**

(3-0) Cr. 3.

*Prereq: C E 355*

Study of designated problems in traffic engineering, transportation planning, and development. Forecasting and evaluation of social, economic, and environmental impacts of proposed solutions; considerations of alternatives. Formulation of recommendations and publication of a report. Presentation of recommendations in the host community.

**C E 559: Transportation Infrastructure/Asset Management**

(3-0) Cr. 3.

*Prereq: C E 355*

Engineering management techniques for maintaining and managing infrastructure assets. Systematic approach to management through value engineering, engineering economics, and life cycle cost analysis. Selection and scheduling of maintenance activities. Analysis of network-wide resource needs. Project level analysis.

**C E 560: Fundamentals of Soil Mechanics**

(3-0) Cr. 3.

*Prereq: C E 360 or instructor approval*

Nature of soil deposits, seepage, settlement and secondary compression, consolidation theories and analysis, failure theories, stress paths, introduction to critical state soil mechanics, constitutive models, soil strength under various drainage conditions, liquefaction of soil, pore pressure parameters, selection of soil parameters.

**C E 561: Applied Foundation Engineering**

(3-0) Cr. 3.

*Prereq: C E 460 or instructor approval*

Analysis and design of shallow and deep foundations, lateral earth pressure theories and retaining structures, field investigations, in-situ testing, and foundations on problematic soils. Foundation engineering reports.

**C E 562: Site Evaluations for Civil Engineering Projects**

(Dual-listed with C E 462). (2-3) Cr. 3.

*Prereq: C E 360 or Permission of Instructor*

Identification and mapping of engineering soils from aerial photos, maps, and soil surveys. Planning subsurface investigations, geomaterials prospecting, geotechnical hazards, geomorphology, in situ testing and sampling, geophysical site characterization, instrumentation and monitoring, interpretation of engineering parameter values for design.

**C E 563: Experimental Methods in Geo-Engineering**

(2-2) Cr. 3.

*Prereq: C E 360 or instructor approval*

Principles of geo-engineering laboratory testing including the conduct, analysis, and interpretation of permeability, consolidation, triaxial, direct and ring shear, and direct simple shear tests. Issues regarding laboratory testing versus field testing and acquisition, transport, storage, and preparation of samples for geotechnical testing. Field and laboratory geotechnical monitoring techniques, including the measurements of deformation, strain, total stress and pore water pressure.

**C E 564: Application of Numerical Methods to Geotechnical Design**

(3-0) Cr. 3.

*Prereq: C E 560 or instructor approval*

Application of numerical methods to analysis and design of foundations, underground structures, and soil-structure interaction. Application of slope stability software. Layered soils, bearing capacity and settlement for complex geometries, wave equation for piles, and foundation vibrations.

**C E 565: Fundamentals of Geomaterials Behavior**

(2-3) Cr. 3.

*Prereq: C E 382 or instructor approval*

Atoms and molecules, crystal chemistry, clay minerals, structure of solids, phase transformations and phase equilibria. Surfaces and interfacial phenomena, colloid chemistry, mechanical properties. Applications to soils and civil engineering materials. Overview of state-of-the-art instrumental techniques for analysis of the physicochemical properties of soils and civil engineering materials.

**C E 567: Geomaterials Stabilization**

(Dual-listed with C E 467). (2-2) Cr. 3.

*Prereq: (C E 360; [C E 382 or C E 383]) or Permission of Instructor*

Soil and aggregate physical, chemical and biological stabilization procedures. Stabilization analysis and design. Ground modification and compaction methods. Geosynthetics application and design.

**C E 568: Dynamics of Soils and Foundations**

(3-0) Cr. 3.

*Prereq: C E 360, E M 345 or instructor approval*

Dynamic soil properties and their measurement. Foundation dynamics and soil-structure interaction. Sources and characteristics of dynamic loads. Vibration of single- and multi-degree-of-freedom systems. Vibration of continuous systems; 1D, 2D, and 3D analyses, wave propagation. Liquefaction concepts and analysis methods. Introduction to geotechnical earthquake engineering.

**C E 569: Ground Improvement**

(3-0) Cr. 3.

*Prereq: C E 360 or instructor approval*

Classification of ground improvement methods. Dynamic compaction, vibrocompaction, preloading using fill surcharge, vacuum or a combination of both and prefabricated vertical drains, vibro replacement or stone columns, dynamic replacement, sand compaction piles, geotextile confined columns, rigid inclusion, column supported embankment, microbial methods, particulate and chemical grouting, lime and cement columns, jet grouting, and deep cement mixing.

**C E 570: Applied Hydraulic Design**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: C E 372*

Flow characteristics in natural and constructed channels; principles of hydraulic design of culverts, bridge waterway openings, spillways, hydraulic gates and gated structures, pumping stations, and miscellaneous water control structures; pipe networks, mathematical modeling. Design project.

**C E 571: Surface Water Hydrology**

(Cross-listed with ENSCI). (3-0) Cr. 3. S.

*Prereq: C E 372*

Analysis of hydrologic data including precipitation, infiltration, evapotranspiration, direct runoff and streamflow; theory and use of frequency analysis; theory of streamflow and reservoir routing; use of deterministic and statistical hydrologic models. Fundamentals of surface water quality modeling, point and non-point sources of contamination.



**C E 572: Analysis and Modeling Aquatic Environments**

(Cross-listed with ENSCI). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372*

Principles of surface water flows and mixing. Introduction to hydrologic transport and water quality simulation in natural water systems. Advection, diffusion and dispersion, chemical and biologic kinetics, and water quality dynamics. Applications to temperature, dissolved oxygen, primary productivity, and other water quality problems in rivers, lakes and reservoirs. Deterministic vs. stochastic models.

**C E 573: Groundwater Hydrology**

(Dual-listed with C E 473). (3-0) Cr. 3. F.

*Prereq: C E 372*

Principles of groundwater flow, hydraulics of wells, superposition, slug and pumping tests, streamlines and flownets, and regional groundwater flow. Contaminant transport. Computer modeling. Design project. Extra assignments required for graduate students.

**C E 576: Environmental Flows**

(3-0) Cr. 3.

*Prereq: A B E 378 or equivalent*

Analysis and applications of flows in civil engineering, environmental engineering, and water resources. Primary topics include conservation laws, laminar flow, turbulence, mixing, diffusion, dispersion, water waves, and boundary layers. Associated applications include particle settling, transfer at air-water and water-sediment boundaries, flow and friction in pipes and open channels, contaminant transport, waves in lakes, jets, plumes, and salt wedges.

**C E 581: Geotechnical and Materials Engineering Seminar**

Cr. R. Repeatable. F.S.

*Prereq: Graduate classification*

(1-0) Students and outside/invited speakers give weekly presentations about the ongoing research work and Geotechnical and Materials Engineering issues. Offered on a satisfactory-fail basis only.

**C E 583: Pavement Analysis and Design**

(Dual-listed with C E 483). (3-0) Cr. 3. S.

*Prereq: C E 360; C E 382*

Analysis, behavior, performance, and structural design of pavement systems. Topics include climate factors, rehabilitation, life cycle design economics, material and system response, pavement foundations and traffic loadings. Development of models for and analysis of pavement systems. Use of transfer functions relating pavement response to pavement performance. Evaluation and application of current and evolving pavement design practices and procedures. Mechanistic-based pavement design techniques and concepts. Analysis of the effects of maintenance activities on pavement performance and economic evaluation of pavement systems. Design project.

**C E 584: Advanced Design of Concretes**

(Dual-listed with C E 484). (2-3) Cr. 3.

*Prereq: C E 382*

Asphalt binder characterization, fundamentals of asphalt rheology, asphalt materials behavior under loading and temperature effects. High-strength, lightweight, fiber-reinforced, and self-consolidating portland cement concretes, mix design, properties, advanced performance testing. Design project.

**C E 586: Advanced Asphalt Materials**

(2-3) Cr. 3.

*Prereq: C E 382*

Advanced asphalt concrete (SUPERPAVE) mix designs. Aggregates. Admixtures. Production and construction, quality control and inspection. Nondestructive testing. Pavement thickness design. Materials engineering reports.

**C E 587: Advanced Portland Cement Concretes**

(2-3) Cr. 3.

*Prereq: C E 382 or C E 383*

Hydraulic cements, aggregates, admixtures, and concrete mix design; cement hydration and microstructure development; fresh, early-age, and mechanical properties of concrete; concrete distress examination, damage mechanism, and prevention.

**C E 588: Sustainable Civil Infrastructure Systems**

(Dual-listed with C E 488). (3-0) Cr. 3. F.

*Prereq: Permission of Instructor*

Sustainable planning, life cycle analysis, appropriate engineering design, investment levels and overall rating of civil engineering infrastructure systems, including highway, bridge, airport, rail, dam, power and port facilities. Complementary assessment of future civil infrastructure sustainability impacts and challenges in relation to autonomous and electric vehicle development. Overview regarding US and global availability and supply of critical infrastructure commodities (e.g., cement, stone, metals, phosphorus, uranium, etc.). Directed course readings and multiple project/design reports.

**C E 589: Pavement Preservation and Rehabilitation**

(Dual-listed with C E 489). Cr. 3. F.S.

*Prereq: C E 382*

Overview of pavement preservation and pavement rehabilitation techniques. Overview and selection of materials used in pavement preservation and rehabilitation strategies. Evaluating suitability of pavement preservation and pavement rehabilitation strategies based on existing structure, pavement distresses and non-condition factors. Use of recycled pavement materials in pavement reconstruction techniques.

**C E 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

Pre-enrollment contract required.

**C E 591: Seminar in Environmental Engineering**

Cr. R. Repeatable. F.S.

*Prereq: Graduate classification*

(1-0) Contemporary environmental engineering issues. Outside speakers. Review of ongoing research in environmental engineering. Offered on a satisfactory-fail basis only.

**C E 594: Special Topics in Construction Engineering and Management**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Some topics have a set number of credits and some topics have the number of credits vary. Emphasis for a particular offering will be selected from the following topics:.

**C E 594A: Special Topics Construction Engineering and Mgt.: Planning and Scheduling**

Cr. 3.

*Prereq: C E 306 or graduate standing*

Studies in planning and scheduling including scheduling and estimating. Credit may not be applied for graduation for Construction Engineering undergraduate students.

**C E 594B: Special Topics Construction Engineering and Mgt.: Computer Applications for Planning and Scheduling**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in computer applications for planning and scheduling.

**C E 594C: Special Topics Construction Engineering and Mgt.: Cost Estimating**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in cost estimating.

**C E 594D: Special Topics Construction Engineering and Mgt.: Computer Applications for Cost Estimating**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in computer applications for cost estimating.

**C E 594E: Special Topics Construction Engineering and Mgt.: Project Controls**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in project controls.

**C E 594F: Special Topics Construction Engineering and Mgt.: Computer Applications for Project Controls**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in computer applications for project controls.

**C E 594G: Special Topics Construction Engr and Mgt: Integration of Planning, Scheduling and Project Controls**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in integration of planning, scheduling and project controls.

**C E 594J: Special Topics Construction Engineering and Mgt.: Trenchless Technologies**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in trenchless technologies.

**C E 594K: Special Topics Construction Engineering and Mgt.: Electrical and Mechanical Construction**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in electrical and mechanical construction.

**C E 594L: Spl Topics Construction Engr and Mgt.: Adv Building Construction Topics - LEED for New Construction**

Cr. 3. SS.

*Prereq: CON E 352 or C E 306 or graduate standing or permission of instructor*

Studies in advanced building construction topics including LEED.

**C E 594M: Special Topics Construction Engineering and Mgt.: Design Build Construction**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in design build construction.

**C E 594N: Special Topics Construction Engineering and Mgt.: Industrial Construction**

Cr. 3.

*Prereq: Graduate standing or permission of instructor*

Studies in industrial construction.

**C E 594O: Special Topics Construction Engineering and Mgt.: Highway and Heavy Construction**

Cr. 3.

*Prereq: CON E 322 or C E 306 or graduate standing*

Studies in highway and heavy construction.

**C E 594P: Special Topics Construction Engineering and Mgt.: Advanced Building Energy Systems and Technologies**

Cr. 3.

*Prereq: CON E 352 or graduate standing or permission of instructor*

Studies in advanced building technologies including building energy modeling, building energy performance and efficiency assessments, and demand side management for smart grid applications.

**C E 594Q: Special Topics Construction Engineering and Mgt.: Construction Quality Control**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in construction quality control.

**C E 594R: Special Topics Construction Engineering and Mgt.: Risk Management**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in risk management.

**C E 594S: Special Topics Construction Engineering and Mgt.: Building Information Modeling**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Studies in building information modeling.

**C E 595: Research Methods in Construction Engineering and Management**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Assigned readings and reports on research methods to solve construction engineering and management problems such as alternative project delivery methods, asset management, data mining, construction procurement, robotics, project controls, automation, construction visualization, etc. Identification of research methods and priorities, selection and development of research design, and critique of research in construction engineering and management.

**C E 595A: Research Methods Seminar in Construction Engineering and Management: Qualitative Methods**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Assigned readings and reports on qualitative research methods to assess and solve construction engineering and management problems.

**C E 595B: Research Methods Seminar in Construction Engineering and Management: Quantitative Methods**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Assigned readings and reports on quantitative research methods to assess and solve construction engineering and management problems.

**C E 595C: Research Methods Seminar in Construction Engineering and Management: Technical Reporting**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Assigned readings and reports on research methods for planning and preparation of technical reports with construction engineering and management projects.

**C E 596: Special Topics in Transportation Engineering**

Cr. arr. Repeatable.

*Prereq: C E 355*

**C E 599: Creative Component**

Cr. 1-3. Repeatable.

Pre-enrollment contract required. Advanced topic for creative component report in lieu of thesis.

**Courses for graduate students:**

**C E 622: Advanced Topics in Environmental Engineering**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 622A: Advanced Topics in Environmental Engineering: Water Pollution Control**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 622B: Advanced Topics in Environmental Engineering: Water Treatment**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 622C: Advanced Topics in Environmental Engineering: Solid and Hazardous Waste**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 622D: Advanced Topics in Environmental Engineering: Water Resources**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 622E: Advanced Topics in Environmental Engineering: Instrumental Methods for Environmental Analyses**

(2-0) Cr. 2. Repeatable.

*Prereq: Permission of environmental engineering graduate faculty*

Advanced concepts in environmental engineering.

**C E 650: Advanced Topics in Transportation Engineering**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of Transportation Engineering graduate faculty*

**C E 650A: Advanced Topics in Transportation Engineering: Highway Design**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of Transportation Engineering graduate faculty*

**C E 650B: Advanced Topics in Transportation Engineering: Traffic Operations**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of Transportation Engineering graduate faculty*

**C E 650C: Advanced Topics in Transportation Engineering: Big Data Analysis**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of Transportation Engineering graduate faculty*

Topics in transportation engineering related to data analysis.

**C E 650D: Advanced Topics in Transportation Engineering: Traffic Simulation**

Cr. 3. Repeatable.

*Prereq: Permission of Transportation Engineering graduate faculty*

**C E 690: Advanced Topics**

Cr. 1-3. Repeatable. F.S.SS.

Pre-enrollment contract required.

**C E 691: Seminar in Transportation Planning**

Cr. 1. Repeatable. F.S.

Provides an overview of current transportation issues; speakers provide seminars on a variety of timely transportation topics.

**C E 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq: Permission of coop advisor, graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**C E 699: Research**

Cr. 1-30. Repeatable.

*Prereq: Pre-enrollment contract required*

Advanced topic for thesis/dissertation.

## Classical Studies (CL ST)

***Any experimental courses offered by CL ST can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**CL ST 273: Greek and Roman Mythology**

(3-0) Cr. 3.

Survey of the legends, myths of the classical world with emphasis on the principal gods, and heroes, and their relation to ancient social, psychological, and religious practices; some attention may be given to important modern theories.

Meets International Perspectives Requirement.

**CL ST 273H: Greek and Roman Mythology: Honors**

(4-0) Cr. 4.

Survey of the legends, myths of the classical world with emphasis on the principal gods, and heroes, and their relation to ancient social, psychological, and religious practices; some attention may be given to important modern theories.

Meets International Perspectives Requirement.

**CL ST 275: The Ancient City**

(3-0) Cr. 3.

Examination of ancient urban life, including historical context, physical space, material culture, religion, literature, and art; examination of civic identity (the "polis"). Contrast between the concepts of urban and rural.

Examples drawn from one or several selected ancient cities; some attention to modern methods of recovering the conditions of ancient urban life and the fundamental concept of the city in European history.

Meets International Perspectives Requirement.

**CL ST 310: Ancient Philosophy**

(Cross-listed with PHIL). (3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Survey of ancient Greek philosophy, focusing on the pre-Socratics, Plato, and Aristotle. Questions concerning being, knowledge, language, and the good life are treated in depth.

**CL ST 350: Rhetorical Traditions**

(Cross-listed with ENGL, SP CM). (3-0) Cr. 3. S.

*Prereq: ENGL 250*

Ideas about the relationship between rhetoric and society in contemporary and historical contexts. An exploration of classical and contemporary rhetorical theories in relation to selected topics that may include politics, gender, race, ethics, education, science, or technology.

**CL ST 353: World Literature: Western Foundations through Renaissance**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Representative works of drama, poetry, and prose from ancient times through the mid-seventeenth century. Consideration of Western traditions within global contexts. Attention to religious and ethnic diversity; oral, manuscript, and print cultures; political authority; and the impact of translation on form, meaning, and reception of texts.

Meets International Perspectives Requirement.

**CL ST 367: Christianity in the Roman Empire**

(Cross-listed with RELIG). (3-0) Cr. 3.

An historical introduction to the rise of Christianity in the Roman empire, with special attention to the impact of Greco-Roman culture on the thought and practice of Christians and the interaction of early Christians with their contemporaries.

**CL ST 368: Religions of Ancient Greece and Rome**

(Cross-listed with RELIG). Cr. 3.

Nature, origins and development of religious beliefs and practices in ancient Greece and Rome from earliest times up to the rise of Christianity. Roles of divinities and rituals in lives of individuals and families and the governing of city-states and empires. Emphasis on historical contexts of the Graeco-Roman world and influences of neighboring cultures in Africa and Asia. None.

Meets International Perspectives Requirement.

**CL ST 369: Ancient Egypt**

(Cross-listed with ANTHR). (3-0) Cr. 3.

Archaeology and culture of Ancient Egypt from prehistory to Late Antiquity. Exploration of literature, religion, social history, government, and architecture. Discussion of major archaeological sites and methods; examination of interaction with other ancient near eastern and Mediterranean civilizations. Meets International Perspectives Requirements.

Meets International Perspectives Requirement.

**CL ST 372: Greek and Roman Tragedy and Comedy**

(3-0) Cr. 3.

Greek and Roman drama from the beginnings until today. Readings in English from authors such as Aeschylus, Sophocles, Euripides, Aristophanes, Menander, Plautus, Terence, Seneca. Course may cover performance, theories of comedy and tragedy, recent and current expressions of the comic and tragic in film and other media.

Meets International Perspectives Requirement.

**CL ST 372H: Greek and Roman Tragedy and Comedy: Honors**

(4-0) Cr. 4.

Greek and Roman drama from the beginnings until today. Readings in English from authors such as Aeschylus, Sophocles, Euripides, Aristophanes, Menander, Plautus, Terence, Seneca. Course may cover performance, theories of comedy and tragedy, recent and current expressions of the comic and tragic in film and other media.

Meets International Perspectives Requirement.

**CL ST 373: Heroes of Greece, Rome, and Today**

(3-0) Cr. 3.

Cultural and political significance of ancient epic, especially in Greece and Rome. Course may include study of the heroic code in antiquity and its modern expressions including in film. Readings in English from authors such as Homer and Vergil.

Meets International Perspectives Requirement.

**CL ST 373H: Heroes of Greece, Rome, and Today: Honors**

(4-0) Cr. 4.

Cultural and political significance of ancient epic, especially in Greece and Rome. Course may include study of the heroic code in antiquity and its modern expressions including in film. Readings in English from authors such as Homer and Vergil.

Meets International Perspectives Requirement.

**CL ST 374: Sex, Gender, and Culture in the Ancient Mediterranean World**

(Cross-listed with HIST, WGS). (3-0) Cr. 3.

Survey of the roles of women and others on the margins and the issues that impacted them in the ancient Greek and Roman worlds. Evidence from literature, the visual arts, and archaeology. Contemporary approaches to studying women, gender, and sexuality in ancient history. Intersections of gender categories with ideas of slave and free status, citizenship, and ethnicity. Readings from ancient and modern sources.

Meets International Perspectives Requirement.

**CL ST 376: Classical Archaeology**

(Cross-listed with ANTHR). (3-0) Cr. 3.

Chronological survey of the material culture of the ancient Graeco-Roman world and the role of archaeological context in understanding the varied aspects of ancient Greek or Roman culture. Among other topics, economy, architecture, arts and crafts, trade and exchange, religion and burial customs will be explored.

Meets International Perspectives Requirement.

**CL ST 376A: Classical Archeology: Bronze Age and Early Iron Age Greece**

(Cross-listed with ANTHR). (3-0) Cr. 3.

An examination of the material culture of Bronze Age and Early Iron Age Greece (ca 3000-700 BCE) and the role of archaeological context in understanding the varied aspects of the cultures that flourished in the region. Primary focus on the urbanized palatial centers that emerged on the island of Crete (Minoan) and in mainland Greece (Mycenaean). Topics include the emergence of social complexity, cultural and technological changes, religious systems, and methods of interpretation.

Meets International Perspectives Requirement.

**CL ST 376B: Classical Archeology: Archaic through Hellenistic Greece (ca 700-30 BCE)**

(Cross-listed with ANTHR). (3-0) Cr. 3.

An examination of the material culture of ancient Greece from ca. 700-30 BCE and the role of archaeological context in understanding the varied aspects of Greek culture found in cities, rural areas, and sanctuaries during the Archaic, Classical, and Hellenistic periods. Topics include urbanization and the rise of the polis, sanctuaries and their offerings, engagement with the wider Mediterranean, and developments in the ways that the Greeks conceptualized and represented their world.

Meets International Perspectives Requirement.

**CL ST 376C: Classical Archaeology: Roman Archaeology (ca 1000 BCE-400 CE)**

(Cross-listed with ANTHR). (3-0) Cr. 3.

An examination of major developments in architecture, sculpture, painting, and other arts of the ancient Roman world and the role of archaeological context in understanding various aspects of Roman culture. Topics include art in the service of social ideology and political propaganda; interactions between the Etruscans, Greeks, and Romans; and the relationship between Rome and its provinces.

Meets International Perspectives Requirement.

**CL ST 383: Greek and Roman Art**

(Cross-listed with ART H). (3-0) Cr. 3.

Greek art from Neolithic to Hellenistic periods. Roman art from the traditional founding to the end of the empire in the West.

**CL ST 383H: Greek and Roman Art: Honors**

(Cross-listed with ART H). (3-0) Cr. 3-4.

Greek art from Neolithic to Hellenistic periods. Roman art from the traditional founding to the end of the empire in the West.

**CL ST 384: Roman Italy: An Introduction**

(Cross-listed with HIST). Cr. 2. Repeatable, maximum of 4 credits. S.

*Prereq: Permission of Instructor*

Introduction to the topography, history, archaeology, monuments, and art of Rome from the 8th century BCE to the 5th century CE; attention given to the culture of modern Italy, preparatory to study abroad in Rome. Enrollment limited to students participating in CL ST 385/HIST 385. Meets International Perspectives Requirement.

**CL ST 385: Study Abroad: Roman Italy: Building the Empire**

(Cross-listed with HIST). Cr. 3. Repeatable, maximum of 6 credits. SS.

*Prereq: CL ST 384 or HIST 384; Permission of Instructor*

Supervised on-site instruction in the history, archaeology, monuments, and art of Rome and environs from the 8th century BCE to the 5th century CE; attention given to the culture of modern Italy.

Meets International Perspectives Requirement.

**CL ST 394: The Archaeology of Greece: An Introduction**

(2-0) Cr. 2. Repeatable, maximum of 4 credits. S.

*Prereq: Permission of Instructor*

Introduction to the topography, history, archaeology, monuments and art of Greece from the Bronze Age through the Ottoman period; attention given to the culture of modern Greece, preparatory to study abroad in Greece (CL ST 395). Enrollment limited to students participating in CL ST 395.

Meets International Perspectives Requirement.

**CL ST 395: Study Abroad: The Archaeology of Greece**

Cr. 2-6. Repeatable, maximum of 9 credits. SS.

*Prereq: CL ST 394; Permission of Instructor*

Supervised on-site instruction in the archaeology, monuments, and art of Greece from the Bronze Age through the Ottoman period; attention given to the culture of modern Greece.

Meets International Perspectives Requirement.

**CL ST 402: Greek Civilization.**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Ancient Greece from the Bronze Age to the Hellenistic period; evolution of the Greek polis and its cultural contributions with a particular emphasis on the writings of Herodotus and Thucydides.



**CL ST 403: Roman Civilization.**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Ancient Rome from the Regal Period to the Fall of the Western Empire; evolution of Roman institutions and Rome's cultural contributions studied through original sources.

**CL ST 410: Soul, Mind, and World in Ancient Greek Philosophy**

(Cross-listed with PHIL). (3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or CL ST, or Permission of Instructor*

Prominent theories of soul and mind developed by Greek philosophers in the classical period, roughly 500 BCE-200 CE, and how the philosophers located these theories within their general metaphysical views. Relationship between mind and body and the roles of reason, desire, and emotion. Philosophers to be studied include Plato, Aristotle, and selected others.

**CL ST 430: Foundations of Western Political Thought**

(Dual-listed with CL ST 530). (Cross-listed with POL S). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the classical period to the renaissance. Topics such as justice, freedom, virtue, the allocation of political power, the meaning of democracy, human nature, and natural law.

**CL ST 480: Seminar in Classical Studies**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Program Director*

Advanced study of a selected topic in Classical Studies. Research paper or project selected by the student.

**CL ST 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 9 credits.

*Prereq: 7 credits in CL ST at the 200-level or higher; Permission of the Program Chair*

Designed to meet the needs of students who wish to study specific topics in classical civilization in areas where courses are not offered, or to pursue such study beyond the limits of existing courses at the advanced level.

**Courses primarily for graduate students, open to qualified undergraduates:**

**CL ST 512: Proseminar in European History**

(3-0) Cr. 3.

*Prereq: Permission of instructor.*

Readings in European history.

**CL ST 512A: Readings Seminar in European History: Ancient**

(Cross-listed with HIST). (3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European history.

**CL ST 530: Foundations of Western Political Thought**

(Dual-listed with CL ST 430). (Cross-listed with POL S). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the classical period to the renaissance. Topics such as justice, freedom, virtue, the allocation of political power, the meaning of democracy, human nature, and natural law.

**CL ST 594: Seminar in European History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**CL ST 594A: Research Seminar in European History: Ancient**

(Cross-listed with HIST). (3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

## Communication Studies (COMST)

**Any experimental courses offered by COMST can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**COMST 101: Introduction to Communication Studies**

(3-0) Cr. 3.

An introduction to communication theory, the development and functions of communication, and a survey of verbal, nonverbal, interpersonal, small group, organizational, and intercultural communication.

**COMST 104: Orientation to Communication Studies**

(1-0) Cr. 1.

*Prereq: Communication Studies major*

Orientation to Communication Studies discipline, program requirements and career opportunities. Required of communication studies majors. Offered on a satisfactory-fail basis only.

**COMST 210: Communication and U.S. Diversity**

(3-0) Cr. 3. F.S.SS.

Introduction to the role of diversity in communication. Developing competent communication with diverse social groups within interpersonal and organizational contexts in the United States. Topics may include structured reflection of one's role in diverse communication experiences, cultural variations in communication mores, impacts of racial/ethnic/gender identities on communication, workplace policies regarding cultural diversity, the intersection of communication and cultural privilege, communication practices that can reduce prejudice/discrimination, and communication characteristics of advocates for diversity.

Meets U.S. Diversity Requirement

**COMST 211: Interpersonal Communication**

(3-0) Cr. 3.

Application of major principles related to interpersonal communication theories, concepts, and research. Emphasis on using interpersonal communication skills effectively.

**COMST 214: Professional Communication**

(3-0) Cr. 3.

Communication theory and skill development in organizational settings. Emphasis on interpersonal skill development, team and meeting facilitation, informational interviewing, individual and team presentations, and self-assessment.

**COMST 218: Conflict Management**

(3-0) Cr. 3.

Exploration of communication theories, principles and methods associated with effective conflict management.

**COMST 301: Human Communication Theory**

(3-0) Cr. 3.

*Prereq: COMST 101*

Examination of the major theories related to human communication; with particular emphasis on theories underlying interpersonal, small group, organizational, and intercultural communication.

**COMST 303: Introduction to Communication Research Methods**

(3-0) Cr. 3.

*Prereq: COMST 101; 3 additional credits in COMST*

An introduction to evaluating, analyzing, and conducting communication research. Provides and overview of quantitative and qualitative approaches to communication research that are beneficial to learn communication concepts and solve communication issues.

**COMST 310: Intercultural Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Examines the theories, principles and research on intercultural communication to enhance cultural sensitivity and to recognize, accept, and adapt to cultural diversity. Interactive assignments.

Meets International Perspectives Requirement.

**COMST 311: Relational Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Contemporary relational communication theories, concepts, and research. Examines issues central to communication and its application in interpersonal relationships.

**COMST 313: Leadership Communication Theories**

(3-0) Cr. 3. F.S.

*Prereq: COMST 101*

Investigation of theories, research and principles of leadership communication. Exploration of the contexts in which leadership and communication occurs, with emphasis on the connection between communication and leadership and the dyadic linkage of leader and follower.

**COMST 314: Organizational Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Theory and research in organizational communication. Provides strategies for assessing and improving individual and organizational communication effectiveness. Addresses issues such as technology, diversity, work-life negotiation, emotional labor, conflict, socialization, and socially responsible organizations. Explores how organizational meaning is created and sustained through human communication.

**COMST 317: Small Group Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Theory and research in small group communication; application to group decision-making and leadership. Includes communication analyses of groups and teams.

**COMST 319: Communication Training and Development**

(3-0) Cr. 3.

*Prereq: COMST 101*

Theories and approaches to communication training and development; includes adult learning theory. Emphasis on the design, presentation and assessment of communication skills in organizational contexts.

**COMST 325: Nonverbal Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Approaches to studying nonverbal communication. Foci include topics such as emotion, gestures, gaze, use of space, and parsing intention in social interaction.

**COMST 327: Persuasion and Social Influence**

(Cross-listed with PSYCH). (3-0) Cr. 3. F.S.SS.

Examination of theories and research in persuasive communication, including attitudes and social influence. Emphasis on persuasive communication strategies in everyday social settings that influence changes in attitudes and actions.

**COMST 330: Computer Mediated Communication**

(3-0) Cr. 3.

*Prereq: COMST 101*

Theories and approaches related to mediated communication in interpersonal and organizational settings. Focus on how new technology impacts human interaction and relationships.

**COMST 404: Research Seminar**

(Dual-listed with COMST 504). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: COMST 301; 3 additional courses from the following: COMST 310, COMST 311, COMST 313, COMST 314, COMST 317, COMST 319, COMST 325, COMST 330, COMST 450A, COMST 450B, SP CM 323*

Capstone communication studies course. Students develop an original research study linked to the study of communication. Data are collected and analyzed. Results are presented in a final research paper and a presentation.

**COMST 450: Special Topics in Communication Studies**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Junior standing or Permission of Instructor*

Research and theory related to special topics and issues in communication studies.

**COMST 450A: Special Topics in Communication Studies: General**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: Junior standing or Permission of Instructor*

Research and theory related to special topics and issues in communication studies.

**COMST 450B: Special Topics in Communication Studies: Health Communication**

(Dual-listed with COMST 550B). (3-0) Cr. 3. F.S.

*Prereq: Junior standing or Permission of Instructor*

Examines research, theories, and concepts relevant to health communication. Topics include studying the interpersonal, organizational, and mediated communication occurring in health care and public health settings, and understanding why effective communication contributes to positive health outcomes.

**COMST 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 9 credits in COMST; Junior classification; Permission of Instructor*

Application must be submitted for approval the semester prior to the independent study.

**COMST 491: Research Practicum**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: COMST 203; COMST 301; Permission of Instructor*

Providing research assistance on projects conducted by Communication Studies faculty.

**COMST 497: Professional Internship**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: COMST 203; COMST 301; 1 additional 300-level COMST course; Junior classification; Department Permission*

100 hours of on-site professional work per credit hour plus completion of the academic requirement set by the internship committee. Application should be submitted in the term prior to the term in which the internship will be served. Internship cannot be used to meet degree requirement in Communication Studies.

**Courses primarily for graduate students, open to qualified undergraduates:**

**COMST 504: Research Seminar**

(Dual-listed with COMST 404). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: COMST 301; 3 additional courses from the following: COMST 310, COMST 311, COMST 313, COMST 314, COMST 317, COMST 319, COMST 325, COMST 330, COMST 450A, COMST 450B, SP CM 323*

Capstone communication studies course. Students develop an original research study linked to the study of communication. Data are collected and analyzed. Results are presented in a final research paper and a presentation.

### **COMST 550B: Special Topics in Communication Studies: Health Communication**

(Dual-listed with COMST 450B). (3-0) Cr. 3. F.S.

*Prereq: Junior standing or Permission of Instructor*

Examines research, theories, and concepts relevant to health communication. Topics include studying the interpersonal, organizational, and mediated communication occurring in health care and public health settings, and understanding why effective communication contributes to positive health outcomes.

### **COMST 590: Special Topics**

Cr. 1-4. Repeatable.

Application must be submitted for approval the semester prior to the independent study.

## **Community and Regional Planning (C R P)**

*Any experimental courses offered by C R P can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

### **C R P 201: The North American Metropolis**

(3-0) Cr. 3. F.S.

Examination of the evolution of American urban centers from the colonial era to the present. Considers the demographic changes and social movements underway in urban America and explores how an understanding of the history of cities provides us with knowledge that we can use to improve our cities today.

### **C R P 211: Digital Design Methods for Landscape Architecture**

(Cross-listed with L A). (3-0) Cr. 3. S.

Foundational knowledge and basic skills in 2D, 3D, and 4D computer applications used for design development and communication, with emphasis on 3D modeling and workflow interoperability.

### **C R P 251: Fundamentals of Geographic Information Systems**

Cr. 3. F.

Fundamentals of the concepts, models, functions and operations of Geographic Information Systems (GIS). Principals of spatial problems, spatial questions and hypotheses and their solutions based on spatial data, GIS tools and techniques. Integration of concepts and applications through lectures and facilitated labs. Applications from a variety of areas including design; physical, social, and human science; engineering; agriculture; business and medicine, landscape architecture, architecture, urban planning, geology, forestry, biology, and ecology.

### **C R P 291: World Cities and Globalization**

(3-0) Cr. 3. F.S.

World cities and globalization in developed and developing countries. Topics include globalization, world cities and regions, uneven economic development, the international division of labor, multinational corporations, international environmentalism, tourism, popular culture and place-based identity. Meets International Perspectives Requirement.

### **C R P 293: Environmental Planning**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

Comprehensive overview of the field of environmental relationships and the efforts being made to organize, control, and coordinate environmental, aesthetic, and cultural characteristics of land, air, and water.

### **C R P 301: Urban Analytical Methods**

(3-2) Cr. 4. S.

*Prereq: STAT 101*

An introduction to the methods and analytical techniques used by planners to study community change. Course includes identification of key sources of planning information and data. Students learn to use quantitative methods for analysis of population, land use, economic and transportation data. Students learn to apply basic analytic methods to community problems and learn the art of effective written, graphic, and oral presentation of data.

### **C R P 320: Urban Geography**

(3-0) Cr. 3. F.S.

An introduction to urban geography. Study of urban centers, including people and infrastructure. Investigation of the origin and evolution of urban areas and the processes that shape urban change. Topics include urban form, and the social, economic, political, cultural, and institutional factors that shape cities.

### **C R P 325: Introduction to Housing**

(3-0) Cr. 3. S.

Introduction to issues related to the topic of housing in the United States. Particular focus on the social and spatial segmentation of housing in the U.S. and the role of policy in housing production and regulation.

### **C R P 330: Practicum**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Enrolled in C R P major*

Structured work experience under close supervision of a professional planner. Practical planning experience; relationships between theory and practice, professional responsibilities, and the scope of various planning roles.

**C R P 331: Professional Practice Seminar**

(2-0) Cr. 2. F.

*Prereq: C R P 301; Junior classification*

Preparation for working as a planning professional; development of resume and portfolio; discussion of professional ethics and expectations of employers and clients; presentations from planning professionals, and discussion of the range of career choices within the planning profession.

**C R P 351: Intermediate Geographic Information Systems**

Cr. 3. F.S.

*Prereq: CRP 251*

Intermediate GIS for design and non-design students to learn concepts of digital management and representation of spatial data, including spatial problems, data sources and structures, simple spatial operations and cartographic issues. Gain skill set to effectively display feature and tabular data, query features using logical expressions, edit spatial and attribute data, associate tables with joins and relates, produce maps, reports, and graphs.

**C R P 376: Rural, Urban and Regional Economics**

(Cross-listed with ECON). (3-0) Cr. 3.

*Prereq: ECON 101*

Firm location with respect to regional resources, transport, scale economies, externalities, and policies. Measures of local comparative advantage and specialization. Spatial markets. Population location considering jobs, wages, commuting, and local amenities. Business, residential, and farm land use and value. Migration. Other topics may include market failure, regulation, the product cycle, theories of rural and urban development, developmental policy, firm recruiting, local public goods and public finance, schools, poverty, segregation, and crime.

**C R P 383: Theory of the Planning Process**

(3-0) Cr. 3. F.

*Prereq: Junior classification*

The nature of planning and its relation to social and economic planning; levels of planning, place of planning in decision making; steps in the planning process, uses and limitation of knowledge in planning, relation of facts and values.

**C R P 391: Field Travel**

Cr. 1-2. Repeatable. F.S.

*Prereq: Enrolled in C R P major; Permission of Instructor*

Observation of professional practice and community or regional problems and issues. Offered on a satisfactory-fail basis only.

**C R P 410: Professional Work Experience**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

Approved professional work experience.

**C R P 416: Urban Design and Practice**

(Dual-listed with C R P 516). (3-6) Cr. 6. S.

*Prereq: C R P 301*

Principles of urban design and their application to residential and commercial development in studio projects.

**C R P 417: Urban Revitalization**

(Dual-listed with C R P 517). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Junior classification*

Planning methods available to further revitalization and preservation efforts, with particular attention to housing and neighborhoods. Relationship between neighborhood change and urban development process; public policy implications.

**C R P 421: Financing Historic Preservation Projects**

(3-0) Cr. 3. F.

Investigation of the financial tools and incentives used to promote the rehabilitation and redevelopment of historic buildings and neighborhoods in cities and towns. Study of broader economic and social impacts on communities. Examinations of completed preservation projects around the United States.

**C R P 429: Planning in Developing Countries**

(Dual-listed with C R P 529). (3-0) Cr. 3. F.S.

Introduction to issues in planning and governance in an international setting. Problems and strategies may include population movement and change, economic globalization, urban growth, rural development, and housing.

**C R P 432: Community Planning Studio**

(1-6) Cr. 4-6. F.S.

*Prereq: (C R P 201 or C R P 301 or C R P 383) or Permission of Instructor*

Integration of planning methods and theory in dealing with a community planning problem. Analysis of problem and formulation of strategies for implementation. Preparation of a community planning report.

**C R P 435: Planning in Small Towns**

(Dual-listed with C R P 535). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Junior classification*

Contemporary planning problems in small towns and the design of viable strategies to enhance their social and economic position in today's society.

**C R P 436: Community Economic Development**

(Dual-listed with C R P 536). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

The nature and process of economic development in the context of community development. Recent changes and trends and their implications for local and regional development. Selected case studies and applications. Contemporary community economic development issues.

**C R P 437: Public Participation in Planning**

(3-0) Cr. 3. S.

Rationale and need for public participation in community planning and development. Techniques used to garner participation, and the ability to integrate techniques into a broader participatory process. Techniques covered will include public hearings, public meetings, social action construct, advisory committees, scenario building, social media and asset mapping. Students will also work with a community to demonstrate skills learned. None

**C R P 442: Site Development**

(Dual-listed with C R P 542). (3-0) Cr. 3. S.

Introduction to site development including site review. Studio project integrating concept, finance, selection, analysis, and design.

**C R P 445: Transportation Policy and Planning**

(Dual-listed with C R P 545). (3-0) Cr. 3. F.

*Prereq: C R P 445: Junior classification; C R P 545: Graduate classification*

Comprehensive overview of key policy issues related to transportation planning and investment in the United States and abroad. Policy issues explored include safety, environmental impact, sustainable communities, and economic development. Policy analysis and planning are studied in conjunction with each policy issue explored. Issues of concern to state, metropolitan, and local governments.

**C R P 449: Geodesign: Planning for Sustainable Futures**

(Dual-listed with C R P 549). (3-0) Cr. 3.

*Prereq: C R P 251*

Geodesign combines design creativity with scientific thinking based on spatial data. Special focus on sustainable development of future neighborhoods, communities, cities and/or countries. Students learn the geodesign process and implement a set of techniques and technologies that enable project conceptualization, data collection and visualization, spatial analysis, design creation, impact evaluation and stakeholder participation. Final project involves developing cases for analysis using GIS software.

**C R P 451: Introduction to Geographic Information Systems**

(2-2) Cr. 3. F.S.SS.

Introduction to geographic information systems, including discussions of GIS hardware, software, data structures, data acquisition, data conversion, data presentation, analytical techniques, and implementation procedures. Laboratory emphasizes practical applications and uses of GIS.

**C R P 452: Geographic Data Management and Planning Analysis**

(Dual-listed with C R P 552). (2-2) Cr. 3. F.S.

*Prereq: C R P 351*

Extensive coverage of geo-relational database concept and design, GIS database creation and maintenance, geographic data manipulation and analysis. GIS output generation and geographic data presentation. Laboratory emphasizes practical applications and uses of GIS.

**C R P 454: Fundamentals of Remote Sensing and Spatial Analysis**

(Dual-listed with C R P 554). (Cross-listed with L A). (3-0) Cr. 3. S.

*Prereq: C R P 351*

Introduction to image processing techniques needed for analysis of optical remote sensing imagery, including filtering, enhancement, and classification. Analysis of elevation surfaces, hydrology, distance, overlays and visual programming with Model Builder. Practical applications in a variety of topics to understand how to analyze imagery.

**C R P 455: Smart and Sustainable Cities**

(Dual-listed with C R P 555). Cr. 3.

Introduction to concepts of smart and sustainable cities. Study of novel technologies for smart and sustainable cities, including sustainable energy, innovative tools for citizens' engagement, improved safety, smart mobility, and happy living. Examples of national and international smart cities. Students may gain experience with ArcGIS Online, ArcUrban and/or other emerging software.

**C R P 456: GIS Programming and Automation**

(Dual-listed with C R P 556). (Cross-listed with A B E). (3-0) Cr. 3. F.

*Prereq: C R P 351*

Introduction to automated geoprocessing in Geographic Information Systems using Python. Focus on learning scripting language and object-oriented programming, automation of custom-designed geoprocessing scripts, and application toward student research and/or interests.

**C R P 457: Geogames for Civic Engagement**

(Dual-listed with C R P 557). (3-0) Cr. 3. S.

Explore, design, and implement participatory geospatial games; define GeoGames; learn about different types of GeoGames and their formal and dramatic elements; design GeoGames for civic engagement, community visioning, and community planning.



**C R P 460: Social Justice and Planning**

(Dual-listed with C R P 560). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Investigation of the topic of social justice as it relates to the challenge of planning more socially just urban societies, emphasizing the importance of social justice issues to planning in a globalized world. Includes a range of issues and case studies of local social justice initiatives, both US and global. Students will complete individual service learning projects as part of the course requirement.

**C R P 471: Real Estate Development**

(3-0) Cr. 3. S.

Summary of the process to develop real property. Using case studies, examine how the development process differs between residential, office, retail and mixed-use projects. Study the development process using a diverse set of analytical tools including market research, planning and legal analysis, and the discounted cash flow method.

**C R P 475: Grant Writing**

(Dual-listed with C R P 575). (1-0) Cr. 1. F.

A short introduction to effective grant writing for the public and non-profit sectors. Includes identifying appropriate funding sources for an organization, identifying goals and objectives, and budgeting.

**C R P 479: Public Finance and Planning**

(Dual-listed with C R P 579). (3-0) Cr. 3. S.

Overview of public finance theory, particularly in how it relates to local governments and the work of planning and community development. Concepts include theories of taxation, challenges unique to local public finance, collective action, and a survey of the different revenue sources used to fund local government.

**C R P 484: Sustainable Communities**

(Dual-listed with C R P 584). (Cross-listed with ENV S). (3-0) Cr. 3. S.

*Prereq: Junior classification*

The history and theory of sustainable community planning. Procedural and substantive dimensions. Case studies of communities engaged in sustainability planning. Use and development of indicators.

**C R P 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Investigation of an approved topic commensurate with student's interest and ability. Offered on a satisfactory-fail basis only.

**C R P 490H: Independent Study: Honors**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Investigation of an approved topic commensurate with student's interest and ability. Offered on a satisfactory-fail basis only.

**C R P 491: Environmental Law and Planning**

(Dual-listed with C R P 591). (Cross-listed with ENV S, L A). (3-0) Cr. 3. S.

*Prereq: 6 credits in natural sciences or Permission of Instructor*

Environmental law and policy as applied in planning at the local and state levels. Brownfields, environmental justice, water quality, air quality, wetland and floodplain management, and local government involvement in ecological protection through land use planning and other programs.

**C R P 492: Planning Law, Administration and Implementation**

(3-0) Cr. 3. F.

*Prereq: Junior classification*

The basis in constitutional, common, and statutory law for the powers of plan implementation. Problems of balancing public and private interests as revealed in the study of leading court cases. Administration of planning agencies and programs.

**C R P 494: Senior Seminar in Planning**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.

*Prereq: Senior classification*

An advanced forum for seniors that focuses upon recent trends and important issues affecting planning today. Topics addressed will vary. A demonstration of understanding of current issues and their effects upon planning applications is expected.

**Courses primarily for graduate students, open to qualified undergraduates:**

**C R P 510: Professional Work Experience**

Cr. R. F.S.SS.

*Prereq: Permission of department chair*

Approved professional work experience.

**C R P 511: Documenting the Historic Built Environment**

Cr. 3-4. F.

*Prereq: Knowledge of GIS helpful but not required.*

Principals and methods for researching, identifying, recording, and analyzing buildings, districts, and sites that are historically or architecturally significant. Classroom and fieldwork components will use real-world historic places as case studies.

**C R P 516: Urban Design and Practice**

(Dual-listed with C R P 416). (3-6) Cr. 6. S.

*Prereq: C R P 301*

Principles of urban design and their application to residential and commercial development in studio projects.

**C R P 517: Urban Revitalization**

(Dual-listed with C R P 417). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Junior classification*

Planning methods available to further revitalization and preservation efforts, with particular attention to housing and neighborhoods.

Relationship between neighborhood change and urban development process; public policy implications.

**C R P 521: Historic Preservation Planning: Theory and Practice**

(3-0) Cr. 3. S.

*Prereq: None*

Introduction to the history, theory, and practice of historic preservation and cultural resource management. Cases exploring preservation in US and global contexts; politics of preservation; preservation technologies; and relationship of preservation to other community issues.

**C R P 526: Real Estate Development**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Overview of the real estate development process. Topics include the history of real estate development, roles of planning and market forces in real estate development, and financial management of real estate development. Projects involve analysis of market niches, market penetration rates, lease rates, synergism and tenant mix, and the go/no go decision applied to residential, commercial, and mixed-use development.

**C R P 527: Sustainable Community Development**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Introduces the central principles of sustainable community design and its implementation in the residential and commercial real estate development sectors. Topics include current practices and regulatory mandates, with a focus on the importance of private participation in the development of sustainable communities.

**C R P 528: Financing Historic Preservation Projects and Revitalizing Communities**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Investigation of the financial tools and incentives used to promote the rehabilitation and redevelopment of historic buildings and neighborhoods in cities and towns. Study of broader economic and social impacts on communities. Examinations of completed preservation projects around the United States.

**C R P 529: Planning in Developing Countries**

(Dual-listed with C R P 429). (3-0) Cr. 3. F.S.

Introduction to issues in planning and governance in an international setting. Problems and strategies may include population movement and change, economic globalization, urban growth, rural development, and housing.

**C R P 530: Practicum**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Graduate classification in Community and Regional Planning*

Practical planning experience. Structured work in range of tasks under close supervision of a professional planner. Relationships between theory and practice, exposure to variety of roles in functioning specialties. Offered on a satisfactory-fail basis only.

**C R P 532: Community Planning Studio**

(3-6) Cr. 4-6. F.

*Prereq: C R P 564 or equivalent*

Comprehension and analysis of various geographic contexts pertinent to community planning and the use of planning theory, tools and techniques in an applied setting. Process of making a community plan: historical patterns, current conditions and strategies for planning.

**C R P 535: Planning in Small Towns**

(Dual-listed with C R P 435). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Junior classification*

Contemporary planning problems in small towns and the design of viable strategies to enhance their social and economic position in today's society.

**C R P 536: Community Economic Development**

(Dual-listed with C R P 436). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

The nature and process of economic development in the context of community development. Recent changes and trends and their implications for local and regional development. Selected case studies and applications. Contemporary community economic development issues.

**C R P 542: Site Development**

(Dual-listed with C R P 442). (3-0) Cr. 3. S.

Introduction to site development including site review. Studio project integrating concept, finance, selection, analysis, and design.

**C R P 545: Transportation Policy and Planning**

(Dual-listed with C R P 445). (3-0) Cr. 3. F.

*Prereq: C R P 445: Junior classification; C R P 545: Graduate classification*

Comprehensive overview of key policy issues related to transportation planning and investment in the United States and abroad. Policy issues explored include safety, environmental impact, sustainable communities, and economic development. Policy analysis and planning are studied in conjunction with each policy issue explored. Issues of concern to state, metropolitan, and local governments.

**C R P 549: Geodesign: Planning for Sustainable Futures**

(Dual-listed with C R P 449). (3-0) Cr. 3.

*Prereq: C R P 251*

Geodesign combines design creativity with scientific thinking based on spatial data. Special focus on sustainable development of future neighborhoods, communities, cities and/or countries. Students learn the geodesign process and implement a set of techniques and technologies that enable project conceptualization, data collection and visualization, spatial analysis, design creation, impact evaluation and stakeholder participation. Final project involves developing cases for analysis using GIS software.

**C R P 550: Making Resilient Environments**

(Cross-listed with SUS E). (3-0) Cr. 3. S.

*Prereq: senior or graduate standing.*

Major theories and ideas revolving around the concept of resilience. Assessing the social and political processes associated with policy making for resilience. Application of the concept of resilience in order to understand and evaluate environments. Evaluate the different approaches toward resilience and develop an understanding of the relationship between sustainability and resilience. Case studies of communities that proactively prepare for, absorb, recover from, and adapt to actual or potential future adverse events.

**C R P 551: Introduction to Geographic Information Systems**

(2-2) Cr. 3. F.S.SS.

Introduction to geographic information systems, including discussions of GIS hardware, software, data structures, data acquisition, data conversion, data presentation, analytical techniques, and implementation procedures. Laboratory emphasizes practical applications and uses of GIS.

**C R P 552: Geographic Data Management and Planning Analysis**

(Dual-listed with C R P 452). (2-2) Cr. 3. F.S.

*Prereq: C R P 351*

Extensive coverage of geo-relational database concept and design, GIS database creation and maintenance, geographic data manipulation and analysis. GIS output generation and geographic data presentation. Laboratory emphasizes practical applications and uses of GIS.

**C R P 553: Analytical Planning/GIS**

(2-2) Cr. 3. F.

*Prereq: C R P 451/C R P 551*

Integration of exploratory, participatory and predictive spatial analyses and 3D visualization into the planning process. GIS tools and techniques are used to automate decision analysis and facilitate future planning in analyzing and visualizing planning actions. Laboratory emphasizes practical uses of GIS tools and techniques.

**C R P 554: Fundamentals of Remote Sensing and Spatial Analysis**

(Dual-listed with C R P 454). (Cross-listed with L A). (3-0) Cr. 3. S.

*Prereq: C R P 351*

Introduction to image processing techniques needed for analysis of optical remote sensing imagery, including filtering, enhancement, and classification. Analysis of elevation surfaces, hydrology, distance, overlays and visual programming with Model Builder. Practical applications in a variety of topics to understand how to analyze imagery.

**C R P 555: Smart and Sustainable Cities**

(Dual-listed with C R P 455). Cr. 3.

Introduction to concepts of smart and sustainable cities. Study of novel technologies for smart and sustainable cities, including sustainable energy, innovative tools for citizens' engagement, improved safety, smart mobility, and happy living. Examples of national and international smart cities. Students may gain experience with ArcGIS Online, ArcUrban and/or other emerging software.

**C R P 556: GIS Programming and Automation**

(Dual-listed with C R P 456). (3-0) Cr. 3. F.

*Prereq: C R P 351*

Introduction to automated geoprocessing in Geographic Information Systems using Python. Focus on learning scripting language and object-oriented programming, automation of custom-designed geoprocessing scripts, and application toward student research and/or interests.

**C R P 557: Geogames for Civic Engagement**

(Dual-listed with C R P 457). (3-0) Cr. 3. S.

Explore, design, and implement participatory geospatial games; define GeoGames; learn about different types of GeoGames and their formal and dramatic elements; design GeoGames for civic engagement, community visioning, and community planning.

**C R P 558: Web Mapping and Spatial Data Visualization**

(Cross-listed with L A). (2-2) Cr. 3.

*Prereq: CRP 451/551. GEOL 452/552 or instructor permission.*

Use and development of online mapping tools and coding to support participatory GIS, Volunteered Geographic Information, information sharing, geodesign, and decision-making actions. Geoprocessing, spatial data science, and user interface design. Laboratory emphasis on practical applications and uses of Web GIS.

**C R P 560: Social Justice and Planning**

(Dual-listed with C R P 460). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Investigation of the topic of social justice as it relates to the challenge of planning more socially just urban societies, emphasizing the importance of social justice issues to planning in a globalized world. Includes a range of issues and case studies of local social justice initiatives, both US and global. Students will complete individual service learning projects as part of the course requirement.

**C R P 561: Planning Theory**

(3-0) Cr. 3. S.

Use and development of theory/action relationship in planning practice. Competing normative theories of planning and their evolution, key components and fundamental critiques. Exploration of planning frameworks and approaches, including comprehensive planning; incrementalism; advocacy; communicative rationality; and others.

**C R P 563: Planning the American Metropolis**

(3-0) Cr. 3. F.

Focus on the historical role of planning in the shaping of American cities and regions, from the beginning of the Republic to the present. Examine the legacy of planning by exploring the intersection of design, politics and policy. Investigate the factors and the processes that produce the built environment.

**C R P 564: Introduction to Analytical Methods for Planning**

(3-0) Cr. 3. F.

Applications of analytical methods in planning with emphasis on the collection, description, analysis, presentation, and interpretation of planning data. Introduction to descriptive statistics. Sources of planning information and data including primary and secondary data types and sources. Demographic analysis, population projection techniques for planning at local and regional levels.

**C R P 566: Policy Analysis and Planning**

(3-0) Cr. 3. F.

Principles and methods for analyzing community problems and policies including forecasting, efficiency and equity measures, cost/benefit, political feasibility, and sensitivity analysis. Examination of social, political, economic, and environmental values and their manifestation in decision making methods used in planning. Application of tools used to analyze planning problems, project evaluation and public policies.

**C R P 568: Planning and Development**

(3-0) Cr. 3. S.

*Prereq: C R P 564 or equivalent*

Exploration and evaluation of the techniques, processes, and professional skills required to effectively manage land use change at various scales. Land classification systems; land supply and needs inventory for residential uses and commercial and employment centers; capacity and needs analysis for public infrastructure. Includes land use planning project(s) designed to apply the methods explored in this and other courses.

**C R P 573: Contemporary Issues in Global Housing**

(3-0) Cr. 3. F.

*Prereq: Senior or graduate standing*

Investigation of broader social and economic processes around the globe from the housing perspective. Case study approach to shelter struggles and the various policy and design responses related to them, as a means of understanding a range of issues important to urban systems including poverty, development, urbanization, migration, social movements and citizenship.

**C R P 575: Grant Writing**

(Dual-listed with C R P 475). (1-0) Cr. 1. F.

A short introduction to effective grant writing for the public and non-profit sectors. Includes identifying appropriate funding sources for an organization, identifying goals and objectives, and budgeting.

**C R P 578: MRED Capstone Project**

(Cross-listed with FIN). (3-0) Cr. 3.

*Prereq: Enrollment in MRED.*

Refinement of students' problem-solving, communication and negotiation skills. Students work on an actual case. Teams will apply knowledge acquired in the classroom to some aspect of a current development on-the-ground and in-process project.

**C R P 579: Public Finance and Planning**

(Dual-listed with C R P 479). (3-0) Cr. 3. S.

Overview of public finance theory, particularly in how it relates to local governments and the work of planning and community development. Concepts include theories of taxation, challenges unique to local public finance, collective action, and a survey of the different revenue sources used to fund local government.

**C R P 584: Sustainable Communities**

(Dual-listed with C R P 484). (3-0) Cr. 3. S.

*Prereq: Junior classification*

The history and theory of sustainable community planning. Procedural and substantive dimensions. Case studies of communities engaged in sustainability planning. Use and development of indicators.

**C R P 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590A: Special Topics: Planning Law, Administration and Implementation**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590B: Special Topics: Economic Development**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590C: Special Topics: Urban Design**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590D: Special Topics: Housing and Urban Revitalization**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590H: Special Topics: Environmental Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590I: Special Topics: Land Use and Transportation Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590N: Special Topics: International Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590O: Special Topics: Spatial Analytical Methods**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590P: Special Topics: Planning in Small Towns**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590Q: Special Topics: Diversity and Equity in Planning**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 590R: Special Topics: Geographic Information Systems**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification and written approval of instructor and department chair on required form*

**C R P 591: Environmental Law and Planning**

(Dual-listed with C R P 491). (Cross-listed with L A). (3-0) Cr. 3. S.

*Prereq: 6 credits in natural sciences or Permission of Instructor*

Environmental law and policy as applied in planning at the local and state levels. Brownfields, environmental justice, water quality, air quality, wetland and floodplain management, and local government involvement in ecological protection through land use planning and other programs.

**C R P 592: Land Use and Development Regulation Law**

(3-0) Cr. 3. F.

An in-depth analysis of the legal constructs that shape the practice of planning and plan implementation in the United States. An exploration of how land use regulations are applied to reconcile the competing needs and diverse uses of land. The positive and negative consequences of developing and implementing regulatory controls will be addressed.

**C R P 595: Seminar in GIS Applications/Research**

(1-0) Cr. 1. F.S.

*Prereq: 9 credits in GIS Certificate program*

Discussion and demonstration of current GIS applications and research in multiple disciplines. Offered on a satisfactory-fail basis only.

**C R P 599: Professional Planning Report**

Cr. arr. Repeatable.

Independent planning project with practical application, including research element.

**Courses for graduate students:**

**C R P 699: Research**

Cr. arr. Repeatable.

## Community Development (COMDV)

*Any experimental courses offered by COMDV can be found*

*at:* [registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**COMDV 502: Theories and Constructs of Community Change**

(3-0) Cr. 3.

Examines the principles and practices of community change. Use of case studies to relate development approaches to conceptual models. Constructs defining community include community capitals, community field and interactionism, human ecology, social identity, community conflict, communitarianism, and central place theory.

**COMDV 503: Community Development Methods**

(3-0) Cr. 3.

Introduction to research methods relevant to community development. Topics include research design and methods of data collection. Conceptual frameworks are used to develop research questions and analyze data. Strategies for reporting research results as a means of community action are examined.

**COMDV 504: Creating Community Change**

(3-0) Cr. 3.

Examines the role of civil society in community planning efforts and a comparative approach to planning theories and approaches. Focuses on change within communities and the roles of government, planners, and citizens in reacting to or shaping change. Explores the relationship of community planning to community development as community responses to change.

**COMDV 505: Analysis of the Community Economy**

(3-0) Cr. 3.

Introduction to theories of community economic growth. Examines drivers of economic growth, community economic base, sources of growth or decline, roles of local government and institutions, analytical tools, and strategies for local economic development. Explores use of data in community economic development and local and regional development action.

**COMDV 530: Community Development Practicum**

(3-0) Cr. 3.

*Prereq: COMDV 502, COMDV 503, COMDV 504, COMDV 505*

Practical community development experience. Structured work in range of tasks under close supervision of a professional community developer. Exploration of relationships between theory and practice, exposure to variety of professional roles in community development, and demonstration of the ability to design community development programming. Demonstrate applications of knowledge gained from previous coursework.

## Community Development GPIDEA (C DEV)

***Any experimental courses offered by C DEV can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**C DEV 502: Community and Natural Resource Management**

(3-0) Cr. 3.

Detailed introduction to community resource management. Theoretical frameworks, methodological investigation, applied practices. Enhancement of ability of community development professionals to work with communities to plan, develop and monitor conversation and development of natural resources with multiple functions.

**C DEV 503: Principles and Strategies of Community Change**

(3-0) Cr. 3.

Analysis of principles and practices of community change and development. Use of case studies to relate community development approaches to conceptual models from diverse disciplines. Exploration of professional practice principles, and student construction of their personal framework for practicing community development.

**C DEV 504: Community Analysis: Introduction to Methods**

(3-0) Cr. 3.

Introduction to research methods relevant to community development. Formulate and begin a research effort, methods of data collection and how conceptual frameworks are used to develop the questions and analyze data. Emphasis on strategies for reporting findings and applying findings in community action and methods of evaluating the entire research process. Significant attention paid to issues of research ethics and inclusiveness.

**C DEV 505: Organizing for Community Change**

(3-0) Cr. 3.

Examines role of civil society in community planning efforts. Comparative approach to planning theories and approaches. Focus on change within communities and the roles of government, planners, and citizens in reacting to or shaping change. Dimensions of social capital and the context of change covered.



**C DEV 506: Community and Regional Economic Analysis I**

(3-0) Cr. 3.

Introduction to concepts of communities and regions, theories of economic growth, drivers of economic growth, the economic base of a community, sources of growth or decline in the community, roles of local government and institutions, and analytical tools. Strategies for local economic development will also be explored.

**C DEV 507: Introduction to Native Communities**

(3-0) Cr. 3.

A base knowledge course. For students currently working within, in partnership with, or considering working with Native communities. Basic understanding within the context of community development of the diversity of the tribal structures and cultures and the unique history and jurisdictional considerations of these nations. Working with tribes, Federal and Indian relations, and governance and cultural issues.

**C DEV 508: Ecological Economics**

(3-0) Cr. 3.

Approaches economy and community by looking at the inherent interdependence, jointness, and potential complementarity between ecology and economy (utility) of a place.

**C DEV 509: Building Native Community and Economic Capacity**

(3-0) Cr. 3.

Focus on non-western approaches to helping Native communities build their capacity. Students will learn to take a participatory, culture-centered, and strength-based approach to development.

**C DEV 510: Indian Country Agriculture and Natural Resources**

(3-0) Cr. 3.

Introduction to the historical and contemporary issues related to natural resource management on Native American lands. Philosophical and economic arguments concerning natural resource conservation, preservation and extraction will be explored.

**C DEV 512: Sustainable Communities**

(3-0) Cr. 3.

Students will learn the conceptual relationships among Community and Sustainable Development and Sustainable Communities and examine the social, environmental, and economic aspects of sustainable communities. The course includes analysis of public policy impacts on community sustainability, practical actions for enhancing sustainability, and changing power dynamics and reward structures involved in incorporating sustainability into Community Development.

**C DEV 513: Economic Development Strategies and Programs**

(3-0) Cr. 3.

Course explores theories of local economic development and addresses the development issues faced by communities in the 21st century. Students will understand and apply concepts from economic development planning, economic analysis, business development, human resource development, community-based development, and high-technology development.

**C DEV 520: Community Development Orientation**

(2-0) Cr. 2.

Introduction to the Community Development program. Focus on on-line delivery methods, graduate level research and writing, technology skills.

**C DEV 521: Housing and Development**

Cr. 3. S.

*Prereq: None.*

Review and evaluation of historical and current housing issues, production, and financial systems, including consideration of racial, ethnic, income, and gender issues as they relate to the role of housing developments and programs in community development.

**C DEV 522: Community Leadership and Capacity Building**

(3-0) Cr. 3.

Defining leadership and applying it to the workplace. Understanding of potential link between leadership and community capacity. Identifying strategies for leadership development in communities.

**C DEV 523: Grantwriting for Community Development Professionals**

(3-0) Cr. 3.

Basic Grant Development and Management will introduce students to the grant-getting process and provide an overview of what happens after a project is funded. The following topics will be covered: researching funding sources, generating cutting edge ideas, assessing needs, planning a project, establishing credibility, formulating a sustainable budget, designing an evaluation plan, managing the funded project, and disseminating project results.

**C DEV 524: Non-Profit Management in Community Development**

(3-0) Cr. 3.

Understanding of how non-profit organizations are run in order that they may participate more fully in community development efforts. Learning skills necessary to assist organizations to manage community development projects and programs, such as, budgeting, planning, personnel, facilities, volunteer management, and fundraising.

**C DEV 525: Role of Tribal Colleges in Economic Development**

(3-0) Cr. 3.

Focus on role of tribally-chartered colleges and universities in economic development within Native communities. Social capital analytic framework to examine and evaluate tribal college model of economic development.

**C DEV 526: Immigration and Community Inclusion**

(3-0) Cr. 3.

Mechanisms for community inclusion and exclusion in relation to immigration will be examined. Aspects of ethnicity, religion, occupation and transnationalism are addressed in terms of community mechanism for incorporating immigrants as community assets.

**C DEV 527: Public and Non-Profit Budgeting**

Cr. 3. SS.

Introduction to the fundamental theories and practices of budgeting in the public and non-profit sectors. Topics covered include overview of budgeting and budget reform, taxation, expenditures, budget preparation and adoption, budget implementation, and performance budgeting.

**C DEV 528: Evaluation of Organizations and Programs**

(3-0) Cr. 3.

*Prereq: C DEV 504 with grade of C or better*

Introduction to the philosophy, techniques, and methodologies of organizational and program evaluation. Overview of program evaluation and theory, techniques to evaluate program processes and performance, evaluation designs, assessing program efficiency, models to diagnose organizations, and methods to assess organizational performance.

**C DEV 530: Toward Ethical Engagement**

(3-0) Cr. 3.

Understanding what ethics are and identify ethical dimensions of a problem. Ability to employ ethical analysis and engagement strategies in public problem-solving.

**C DEV 532: Community and Regional Economic Analysis II**

(3-0) Cr. 3.

*Prereq: C DEV 506*

Substantive grounding in the theories and practice of measuring community economic dynamics; build solid foundation skills for applied community economic analysis.

**C DEV 590: Special Topics in Community Development**

Cr. 1-3. Repeatable, maximum of 4 times. F.S.SS.

Special topics in Community Development. Independent Study, must get instructor approval.

**C DEV 599: Creative Component**

Cr. arr.

Students work with major professor to conduct research and carry out work on their creative component. Instructor permission required.

**Courses for graduate students:****C DEV 699: Thesis Research**

Cr. 1-6. F.S.SS.

Thesis Research.

## Computer Engineering (CPR E)

***Any experimental courses offered by CPR E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****CPR E 131: Introduction to Computer Security Literacy**

(Cross-listed with CYBSC). (1-0) Cr. 1.

Basic concepts of practical computer and Internet security: passwords, firewalls, antivirus software, malware, social networking, surfing the Internet, phishing, and wireless networks. This class is intended for students with little or no background in information technology or security. Basic knowledge of word processing required. Offered on a satisfactory-fail basis only.

**CPR E 166: Professional Programs Orientation**

(Cross-listed with E E). Cr. R. F.S.

(1-0) Overview of the nature and scope of electrical engineering and computer engineering professions. Overview of portfolios. Departmental rules, advising center operations, degree requirements, program of study planning, career options, and student organizations. Offered on a satisfactory-fail basis only.

**CPR E 184: Computer Engineering Learning Community**

Cr. 1. F.

*Prereq: Member of Cpr E Learning Community*

Integration of first-year students into the Computer Engineering program. Assignments and activities involving teamwork, academic preparation, study skills, and preparation for entry into the Computer Engineering profession. Completed both individually and in learning teams under the direction of faculty and peer mentors.

**CPR E 185: Introduction to Computer Engineering and Problem Solving I**  
(2-2) Cr. 3.

*Prereq:* (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165

Introduction to Computer Engineering. Project based examples from computer engineering. Individual interactive skills for small and large groups. Computer-based projects. Solving engineering problems and presenting solutions through technical reports. Solution of engineering problems using a programming language. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**CPR E 186: Introduction to Computer Engineering and Problem Solving II**  
(0-2) Cr. 1. S.

*Prereq:* CPR E 185

Project based examples from computer engineering. Group skills needed to work effectively in teams. Group problem solving. Computer based projects. Technical reports and presentations. Students will work on 2 or 3 self-directed team based projects that are representative of problems faced by computer engineers.

**CPR E 230: Cyber Security Fundamentals**

(Cross-listed with CYB E). (2-2) Cr. 3. F.

*Prereq:* COM S 227 or E E 285 or MIS 207.

Introduction to computer and network infrastructures used to support cyber security. Basic concepts of computer and network configuration used to secure environments. Computer virtualization, network routing and address translation, computer installation and configuration, network monitoring, in a virtual environment. Laboratory experiments and exercises including secure computer and network configuration and management.

**CPR E 231: Cyber Security Concepts and Tools**

(Cross-listed with CYB E). (2-2) Cr. 3. S.

*Prereq:* CPR E 230 or CYB E 230

Basic concepts of practical computer and Internet security and the tools used to protect and attack systems and networks. Computer and network security methods including: user authentication, access control, firewalls, intrusion detection, use of vulnerability assessment tools and methods, and penetration testing. Ethics and legal issues in cyber security will also be covered. Laboratory experiments and exercises including evaluating systems for vulnerabilities, understanding potential exploits of the systems, and defenses for the systems.

**CPR E 232: Professional and Ethical Issues in Electrical and Computer Engineering**

(Cross-listed with E E). (3-0) Cr. 3.

*Prereq:* COM S 227 or E E 285

Professional and ethical issues in electrical and computer engineering. Soft skills, including communication and leadership skills, and how they relate to the engineering profession. Case studies illustrating ethical decision making in an engineering context and differentiating between moral and professional ethics. Issues of diversity, equity, and inclusion in the engineering profession.

**CPR E 234: Legal, Professional, and Ethical Issues in Cyber Systems**

(Cross-listed with CYB E). (3-0) Cr. 3. S.

*Prereq:* COM S 227, or E E 285, or MIS 207

Emphasizes legal, ethical, and professional issues in cyber systems. Other topics include privacy, government regulation, and compliance as applied to professional practice. Guest lecturer from government and industry, as well as discussions including current legal and ethical issues found in the main stream.

**CPR E 261: Transfer Orientation**

(Cross-listed with E E). Cr. R.

Introduction to the College of Engineering and the engineering profession specifically for transfer students. Information concerning university and college policies, procedures, and resources. Offered on a satisfactory-fail basis only.

**CPR E 281: Digital Logic**

(3-3) Cr. 4. F.S.

*Prereq:* Sophomore classification

Number systems and representation. Boolean algebra and logic minimization. Combinational and sequential logic design. Arithmetic circuits and finite state machines. Use of programmable logic devices. Introduction to computer-aided schematic capture systems, simulation tools, and hardware description languages. Design of simple digital systems.

**CPR E 288: Embedded Systems I: Introduction**

(3-2) Cr. 4. F.S.

*Prereq:* CPR E 281; (COM S 207 or COM S 227 or E E 285)

Embedded C programming. Interrupt handling. Memory mapped I/O in the context of an application. Elementary embedded design flow/ methodology. Timers, scheduling, resource allocation, optimization, state machine based controllers, real time constraints within the context of an application. Applications laboratory exercises with embedded devices.

**CPR E 294: Program Discovery**

(Cross-listed with E E). Cr. R.

*Prereq: CPR E 166 or E E 166*

The roles of professionals in computer and electrical engineering. Relationship of coursework to industry and academic careers. Issues relevant to today's world. Offered on a satisfactory-fail basis only.

**CPR E 308: Operating Systems: Principles and Practice**

(3-3) Cr. 4. F.S.

*Prereq: COM S 321 or CPR E 381*

Operating system concepts, processes, threads, synchronization between threads, process and thread scheduling, deadlocks, memory management, file systems, I/O systems, security, Linux-based lab experiments.

**CPR E 310: Theoretical Foundations of Computer Engineering**

(3-1) Cr. 3. F.S.

*Prereq: COM S 228*

Propositional logic and methods of proof; basic discrete structures; mathematical induction and recurrence relations; functions and relations; and counting; trees and graphs; applications in computer engineering.

**CPR E 329: Software Project Management**

(Cross-listed with S E). (3-0) Cr. 3.

*Prereq: COM S 309*

Process-based software development. Capability Maturity Model (CMM). Project planning, cost estimation, and scheduling. Project management tools. Factors influencing productivity and success. Productivity metrics. Analysis of options and risks. Version control and configuration management. Inspections and reviews. Managing the testing process. Software quality metrics. Modern software engineering techniques and practices.

**CPR E 330: Integrated Electronics**

(Cross-listed with E E). (3-3) Cr. 4.

*Prereq: CPR E 281; E E 201; credit or concurrent enrollment in E E 230*

Semiconductor technology for integrated circuits. Modeling of integrated devices including diodes, BJTs, and MOSFETs. Physical layout. Circuit simulation. Digital building blocks and digital circuit synthesis. Analysis and design of analog building blocks. Laboratory exercises and design projects with CAD tools and standard cells.

**CPR E 331: Application of Cryptographic Concepts to Cyber Security**

(Cross-listed with CYB E). Cr. 3. F.S.

*Prereq: CPR E 231 or CYB E 231*

Basic cryptographic underpinnings used in modern cyber security encryption suites. Encryption benefits to cyber security and its use in protocols. Topics include cryptographically secure hash functions and pseudorandom numbers, key distribution techniques, secure authentication including single sign on. Detection and prevention of security threats such as covert communication, malicious code, and other security threats in protocols are included. In addition to laboratory experiments and exercises, students complete a project focused on cyber security problem and solution. Only one of CPR E/CYB E 331 and CPR E 431 may count towards graduation.

**CPR E 332: Cyber Defense Competition**

(Cross-listed with CYBSC). (0-2) Cr. 1. Repeatable. S.

Participation in cyber defense competition driven by scenario-based network design. Includes computer system setup, risk assessment and implementation of security systems, as well as defense of computer and network systems against trained attackers. Team based. Offered on a satisfactory-fail basis only.

**CPR E 339: Software Architecture and Design**

(Cross-listed with S E). (3-0) Cr. 3.

*Prereq: S E 319*

Modeling and design of software at the architectural level. Architectural styles. Basics of model-driven architecture. Object-oriented design and analysis. Iterative development and unified process. Design patterns. Design by contract. Component based design. Product families. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reliability, reusability, etc. Analysis and evaluation of software architectures. Introduction to architecture definition languages. Basics of software evolution, reengineering, and reverse engineering. Case studies. Introduction to distributed system software.

**CPR E 381: Computer Organization and Assembly Level Programming**

(3-2) Cr. 4. F.S.

*Prereq: CPR E 288*

Introduction to computer organization, evaluating performance of computer systems, instruction set design. Assembly level programming: arithmetic operations, control flow instructions, procedure calls, stack management. Processor design. Datapath and control, scalar pipelines, introduction to memory and I/O systems.

**CPR E 388: Embedded Systems II: Mobile Platforms**

(3-2) Cr. 4.

*Prereq: CPR E 288*

Contemporary programming techniques for event driven systems. Mobile platforms and operating systems. Location and motion sensors based user interfaces. Threading and scheduling. Resource management - measurement and control techniques - for memory and energy. Client-server application design. Distributed applications. Laboratory includes exercises based on a mobile platform.

**CPR E 394: Program Exploration**

(Cross-listed with E E). Cr. R.

*Prereq: CPR E 294 or E E 294*

Exploration of academic and career fields for electrical and computer engineers. Examination of professionalism in the context of engineering and technology with competencies based skills. Introduction to professional portfolio development and construction. Offered on a satisfactory-fail basis only.

**CPR E 412: Formal Methods in Software Engineering**

(Cross-listed with COM S, S E). (3-0) Cr. 3.

*Prereq: COM S 311; STAT 305 or STAT 330 or STAT 341; for graduate credit: graduate standing or permission of instructor*

A study of formal techniques for model-based specification and verification of software systems. Topics include logics, formalisms, graph theory, numerical computations, algorithms and tools for automatic analysis of systems. Graduate credit requires in-depth study of concepts.

**CPR E 414: Introduction to Software Systems for Big Data Analytics**

Cr. 4. F.

*Prereq: COM S 363; or CPR E 315 or CPR E 308; or COM S 311 or COM S 352*

Introduction to different perspectives of the "data universe" and trade-offs when choosing an appropriate perspective. Impact of the concept(s) of analytics – from raw data, through its storage/representation, to interacting and querying (linguistic/interface issues). Focused studies on 3-4 different domains, followed by generalization of the concepts/abstractions and preparing the students for the next course in this realm, targeting different domains/problems. Understanding the dependencies between problem-domain needs and the data properties, and their impact on choosing appropriate analytics tools (and how/why those tools were developed and exist in the manners that they do). In addition, the students will be exposed to (limited selection of) internals of such tools.

**CPR E 416: Software Evolution and Maintenance**

(Cross-listed with S E). (3-0) Cr. 3.

*Prereq: COM S 309*

Practical importance of software evolution and maintenance, systematic defect analysis and debugging techniques, tracing and understanding large software, impact analysis, program migration and transformation, refactoring, tools for software evolution and maintenance, experimental studies and quantitative measurements of software evolution. Written reports and oral presentation.

**CPR E 418: High Speed System Engineering Measurement and Testing**

(Cross-listed with E E). (3-2) Cr. 4. F.

*Prereq: E E 230 and E E 311*

Measurement of high speed systems and mixed signal systems. Measurement accuracy and error. Network analysis and spectrum analysis used in high speed measurement and testing. Test specification process and parametric measurement. Sampling and digital signal processing concepts. Design for testability. Testing equipment. Applications.

**CPR E 419: Software Tools for Large Scale Data Analysis**

(Cross-listed with S E). (3-3) Cr. 4.

*Prereq: COM S 363 or COM S 352 or CPR E 308; COM S 228*

Software tools for managing and manipulating large volumes of data, external memory processing, large scale parallelism, and stream processing, data interchange formats. Weekly programming labs that involve the use of a parallel computing cluster.

**CPR E 421: Software Analysis and Verification for Safety and Security**

(Cross-listed with S E). Cr. 3. F.S.

*Prereq: (COM S 230 or CPR E 310); COM S 309*

Significance of software safety and security; various facets of security in cyber-physical and computer systems; threat modeling for software safety and security; and categorization of software vulnerabilities. Software analysis and verification: mathematical foundations, data structures and algorithms, program comprehension, analysis, and verification tools; automated vs. human-on-the-loop approach to analysis and verification; and practical considerations of efficiency, accuracy, robustness, and scalability of analysis and verification. Cases studies with application and systems software; evolving landscape of software security threats and mitigation techniques. Understanding large software, implementing software analysis and verification algorithms.

**CPR E 424: Introduction to High Performance Computing**

(Cross-listed with COM S, MATH). (2-2) Cr. 3. F.

*Prereq: (MATH 265; [MATH 207 or MATH 317]) or Permission of Instructor* Unix, serial programming of scientific applications, OpenMP for shared-memory parallelization. No Unix, Fortran or C experience required.

### **CPR E 425: High Performance Computing for Scientific and Engineering Applications**

(Cross-listed with COM S). (2-2) Cr. 3.

*Prereq:* COM S 311; ENGL 250; SP CM 212

Introduction to high performance computing platforms including parallel computers and workstation clusters. Discussion of parallel architectures, performance, programming models, and software development issues. Sample applications from science and engineering. Practical issues in high performance computing will be emphasized via a number of programming projects using a variety of programming models and case studies. Oral and written reports.

### **CPR E 426: Introduction to Parallel Algorithms and Programming**

(Dual-listed with CPR E 526). (Cross-listed with COM S). (3-2) Cr. 4. F.

*Prereq:* (CPR E 308 or COM S 321); (CPR E 315 or COM S 311)

Models of parallel computation, performance measures, basic parallel constructs and communication primitives, parallel programming using MPI, parallel algorithms for selected problems including sorting, matrix, tree and graph problems, fast Fourier transforms.

### **CPR E 430: Network Protocols and Security**

(Dual-listed with CPR E 530). (Cross-listed with CYBSC). (3-0) Cr. 3.

*Prereq:* CPR E 308 OR COM S 252 OR COM S 352. *E E students:* CPR E 288.

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

### **CPR E 431: Basics of Information System Security**

(3-0) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in CPR E 308 or COM S 352

Introduction to and application of basic mechanisms for protecting information systems from accidental and intentional threats. Basic cryptography use and practice. Computer security issues including authentication, access control, and malicious code. Network security mechanisms such as intrusion detection, firewalls, SSL/TLS, and related protocols. Ethics and legal issues in information security. Wireless security. Programming and system configuration assignments. This course can not be used towards any requirements for the Cyber Security Degree or Minor. Only one of CPR E/CYB E 331 and CPR E 431 may count towards graduation.

### **CPR E 435: Analog VLSI Circuit Design**

(Cross-listed with E E). (3-3) Cr. 4. S.

*Prereq:* E E 330

Basic analog integrated circuit and system design including design space exploration, performance enhancement strategies, operational amplifiers, references, integrated filters, and data converters.

### **CPR E 440: Operating System Security**

(Cross-listed with CYB E). (3-0) Cr. 3. S.

*Prereq:* CPR E 308 OR COM S 352.

Focus on fundamentals and advanced topics in operating system (OS) security. Design issues, principles, mechanisms, and good practice for design and implementation of secure computer/OS systems. Threat models, vulnerabilities, attacks compromise security, and advanced OS-level techniques for achieving security. Topics include OS security concepts and principles, seminal security in Multics, vulnerabilities in ordinary systems, secure capability systems, information flow control, mandatory access control, security kernels, memory protection, file system, virtual machine systems, hardware/architecture support (e.g., Intel SGX) for OS security, secure microkernel OSes (e.g., seL4, QNX), modern mobile operating systems (e.g., Android and iOS), and security from end-user perspective. Assignments include labs exploring and implementing the technologies in the context of the Linux, Android, and seL4 systems (some involving kernel programming).

### **CPR E 450: Distributed Systems and Middleware**

(Dual-listed with CPR E 550). (3-0) Cr. 3.

*Prereq:* CPR E 308 or COM S 352

Fundamentals of distributed computing, software agents, naming services, distributed transactions, security management, distributed object-based systems, web-based systems, Blockchain, middleware-based application design and development, case studies of middleware and internet applications.

### **CPR E 454: Distributed Systems**

(Dual-listed with CPR E 554). (Cross-listed with COM S). (3-1) Cr. 3.

*Prereq:* COM S 311; COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor

Theoretical and practical issues of design and implementation of distributed systems. The client server paradigm, inter-process communications, synchronization and concurrency control, naming, consistency and replication, fault tolerance, and distributed file systems. Graduate credit requires additional in-depth study of concepts. Programming projects and written reports.

### **CPR E 458: Real Time Systems**

(Dual-listed with CPR E 558). (3-0) Cr. 3.

*Prereq:* CPR E 308 or COM S 352

Fundamental concepts in real-time systems. Real time task scheduling paradigms. Resource management in uniprocessor, multiprocessor, and distributed real-time systems. Energy management in real-time systems and sensor networks. Fault-tolerance and overload handling in real-time systems. Real-time channel, QoS routing, traffic policing, packet scheduling, and real-time LAN protocols. Case study of real-time and IoT applications. Term project in real-time systems and networks.



**CPR E 465: Digital VLSI Design**

(Cross-listed with E E). (3-3) Cr. 4. F.

*Prereq: E E 330*

Digital design of integrated circuits employing very large scale integration (VLSI) methodologies. Technology considerations in design. High level hardware design languages, CMOS logic design styles, area-energy-delay design space characterization, datapath blocks: arithmetic and memory, architectures and systems on a chip (SOC) considerations. VLSI chip hardware design project.

**CPR E 480: Graphics Processing and Architecture**

(Dual-listed with CPR E 580). (3-3) Cr. 4. S.

*Prereq: CPR E 381 or COM S 321*

Introduction to hardware architectures for computer graphics and their programming models. System-level view, including framebuffers, video output devices, displays, 2D and 3D graphics acceleration, and device interfacing. Architectural design of GPUs, from 2D and 3D sprite engines to 3D rendering pipelines to unified shader architectures. Computing models for graphics processors. GPGPU and GPU computing.

**CPR E 487: Hardware Design for Machine Learning**

(3-3) Cr. 4.

*Prereq: CPR E 381 or COM S 321*

Introduction to hardware architectures for machine learning. Full system view – machinelearning frameworks to hardware interface to hardware architecture. General purpose CPU extensions for machine learning. GPU extensions for machine learning. Spatial architectures for machine learning. Performance, energy, and accuracy trade-offs. Hardware design optimizations for machine learning, including quantization, data re-use, SIMD, and SIMT. Lab section will culminate with the design and evaluation of an application-specific machinelearning accelerator.

**CPR E 488: Embedded Systems Design**

(3-3) Cr. 4.

*Prereq: CPR E 381 or COM S 321*

Embedded microprocessors, embedded memory and I/O devices, component interfaces, embedded software, program development, basic compiler techniques, platform-based FPGA technology, hardware synthesis, design methodology, real-time operating system concepts, performance analysis and optimizations.

**CPR E 489: Computer Networking and Data Communications**

(3-2) Cr. 4. F.S.

*Prereq: CPR E 288 OR COM S 327*

Modern computer networking and data communications concepts. OSI reference model, TCP/IP architecture. Sockets programming. Protocols at the physical layer, data link layer, network layer, transport layer, and application layer. Software-defined networking.

**CPR E 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Senior classification in computer engineering*

Investigation of an approved topic.

**CPR E 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: Senior classification in computer engineering*

Investigation of an approved topic.

**CPR E 491: Senior Design Project I and Professionalism**

(Cross-listed with E E, S E). (2-3) Cr. 3. F.S.

*Prereq: CPR E major: CPR E 232, cr or enrollment in CPR E 308, completion of 29 cr in the CPRE prof prog, ENGL 314. E E major: E E 232, cr or enrollment in E E 322, completion of 24 cr in the EE prof prog, ENGL 314. S E major: S E 317 and S E 339, ENGL 309 or ENGL 314. Co-req: CPR E 308 or COM S 352*

Preparing for entry to the workplace. Selected professional topics. Use of technical writing skills in developing project plan and design report; design review presentation. First of two-semester team-oriented, project design and implementation experience.

**CPR E 492: Senior Design Project II**

(Cross-listed with E E, S E). (1-3) Cr. 2. F.S.

*Prereq: CPR E 491 or E E 491 or S E 491*

Second semester of a team design project experience. Emphasis on the successful implementation and demonstration of the design completed in E E 491, Cpr E 491, or S E 491 and the evaluation of project results. Technical writing of final project report; oral presentation of project achievements; project poster.

**CPR E 494: Portfolio Assessment**

(Cross-listed with E E). Cr. R.

*Prereq: CPR E 232 or E E 232 or CYB E 234; credit or concurrent enrollment in CPR E 491 or E E 491*

Portfolio update and evaluation. Portfolios as a tool to enhance career opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**CPR E 511: Design and Analysis of Algorithms**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: COM S 311*

A study of algorithm design and analysis techniques. Network flows and linear programming. Randomized algorithms. NP-completeness. Approximation algorithms. Fixed-parameter algorithms.

**CPR E 513: Program Analysis**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq:* (COM S 327 or CPR E 288); COM S 342

Algorithms, AI techniques and tools for automatically reasoning about code and program executions. Theory and foundations related to control flow analysis, dataflow analysis, abstract interpretation, and symbolic execution. Applications of program analysis to bug detection, test input generation, debugging, program repair, specification inference and trustworthy AI engineering. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

**CPR E 522: Cognitive Radio Networks**

(Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq:* Permission of instructor

Topics on cognitive radio networks: Cognitive Radio Networks Architecture; Software Defined Radio Architecture; Spectrum Sensing; Spectrum Management; Spectrum Sharing; Spectrum Mobility; Applications of Cognitive Radio Networks.

**CPR E 525: Numerical Analysis of High Performance Computing**

(Cross-listed with COM S, MATH). (3-0) Cr. 3. S.

*Prereq:* CPR E 308 or MATH 481; experience in scientific programming; knowledge of FORTRAN or C

Introduction to parallelization techniques and numerical methods for distributed memory high performance computers. A semester project in an area related to each student's research interests is required.

**CPR E 526: Introduction to Parallel Algorithms and Programming**

(Dual-listed with CPR E 426). (Cross-listed with COM S). (3-2) Cr. 4. F.

*Prereq:* (CPR E 308 or COM S 321); (CPR E 315 or COM S 311)

Models of parallel computation, performance measures, basic parallel constructs and communication primitives, parallel programming using MPI, parallel algorithms for selected problems including sorting, matrix, tree and graph problems, fast Fourier transforms.

**CPR E 527: Concurrent Systems**

(Cross-listed with COM S). Cr. 3.

*Prereq:* COM S 352 or CPR E 308

Fundamentals and advances in concurrent systems in the context of GPUs, TPUs, multicore and HPC systems with specific focus on parallel programming models. Discussion of high-performance computing, GPGPU, scaling deep neural network training and machine learning algorithms, high-performance deep learning, engineering parallel software and and parallel design patterns.

**CPR E 528: Probabilistic Methods in Computer Engineering**

(3-0) Cr. 3.

*Prereq:* CPR E 315 or COM S 311

The application of randomization and probabilistic methods in the design of computer algorithms, and their efficient implementation. Discrete random variables in modeling algorithm behavior, with applications to sorting, selection, graph algorithms, hashing, pattern matching, cryptography, distributed systems, and massive data set algorithmics.

**CPR E 529: Data Analytics in Electrical and Computer Engineering**

(Cross-listed with E E). (3-0) Cr. 3. S.

*Prereq:* E E 322 or equivalent

Introduces a variety of data analytics techniques # particularly those relevant for electrical and computer engineers # from a foundational perspective. Topics to be covered include techniques for classification, visualization, and parameter estimation, with applications to signals, images, matrices, and graphs. Emphasis will be placed on rigorous analysis as well as principled design of such techniques.

**CPR E 530: Network Protocols and Security**

(Dual-listed with CPR E 430). (Cross-listed with CYBSC). (3-0) Cr. 3.

*Prereq:* CPR E 308 OR COM S 252 OR COM S 352. E E students: CPR E 288.

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

**CPR E 531: Information System Security**

(Cross-listed with CYBSC). (3-0) Cr. 3.

*Prereq:* CPR E 489 or CPR E 530 or COM S 586 or MIS 535

Computer, software, and data security: basic cryptography, security policies, multilevel security models, attack and protection mechanisms, legal and ethical issues.

**CPR E 532: Information Warfare**

(Cross-listed with CYBSC). (3-0) Cr. 3. S.

*Prereq:* CPR E 430 or 530

Computer system and network security: implementation, configuration, testing of security software and hardware, network monitoring. Authentication, firewalls, vulnerabilities, exploits, countermeasures. Study and use of attack tools. Ethics in cyber security. Emphasis on laboratory experiments.

**CPR E 533: Cryptography**

(Cross-listed with CYBSC, MATH). (3-0) Cr. 3. S.

*Prereq:* MATH 301 or CPR E 310 or COM S 230

Basic concepts of secure communication, DES and AES, public-key cryptosystems, elliptic curves, hash algorithms, digital signatures, applications. Relevant material on number theory and finite fields.

**CPR E 534: Legal and Ethical Issues in Cyber Security**

(Cross-listed with CYBSC, POL S). (3-0) Cr. 3. S.

*Prereq: Graduate classification; CPR E 531 or CYBSC 531*

Legal and ethical issues in computer security. State and local codes and regulations. Privacy issues.

**CPR E 535: Steganography and Digital Image Forensics**

(Cross-listed with CYBSC, MATH). (3-0) Cr. 3. S.

*Prereq: E E 524 or MATH 317 or MATH 407 or COM S 230*

Basic principles of covert communication, steganalysis, and forensic analysis for digital images. Steganographic security and capacity, matrix embedding, blind attacks, image forensic detection and device identification techniques. Related material on coding theory, statistics, image processing, pattern recognition.

**CPR E 536: Computer and Network Forensics**

(Cross-listed with CYBSC). (3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Fundamentals of computer and network forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anonymity and pseudonymity, privacy-protection techniques, cyber law, computer security policies and guidelines, court testimony and report writing, and case studies. Emphasis on hands-on experiments.

**CPR E 537: Wireless Network Security**

(3-0) Cr. 3. S.

*Prereq: Credit or enrollment in CPR E 489 or CPR E 530*

Introduction to the physical layer and special issues associated with the security of wireless networks. The basics of wireless communication systems (antennas and propagation, modulation, multiple access, channel modeling, specific security issues of the wireless link), jamming and countermeasures (spread spectrum technologies, channel coding, interleaving), authentication and confidentiality (basics of classic cryptography, common authentication and encryption algorithms). Detailed case studies on authentication, encryption and privacy flaws, and good practices based on the most common wireless technologies, including WiFi, GSM/3G, Bluetooth, and RFID. Individual or team-based class projects.

**CPR E 538: Reverse Engineering and Security Testing**

(Cross-listed with CYBSC). (2-3) Cr. 3. S.

*Prereq: COM S 321 or CPR E 381, COM S 352 or CPR E 308*

Techniques and tools for understanding the behavior of software/hardware systems based on reverse engineering. Flaw hypothesis, black, grey, and white box testing as well as other methods for testing the security of software systems. Discussion of counter-reverse engineering techniques.

**CPR E 539: Cyber Physical System Security for the Smart Grid**

(3-0) Cr. 3. S.

Introduction to cyber security, cyber physical system (CPS), and smart grid automation technologies; supervisor control and data acquisition (SCADA) systems; cyber risk modeling, vulnerability analysis, impact analysis, defense and mitigation techniques; cyber security of wide-area monitoring, protection, and control; security and privacy in advanced metering infrastructure (AMI), cyber security compliance and best practices, CPS security test-beds and attack-defense hands-on laboratory experiments.

**CPR E 541: High-Performance Communication Networks**

(3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Computer architectures and protocols designed for high-performance networking environments; software defined networking (SDN) and supporting protocols; cloud and data center networks; network traffic management and congestion control strategies; quality of service; high-speed access network protocols.

**CPR E 542: Optical Communication Networks**

(3-0) Cr. 3. S.

*Prereq: CPR E 489*

Optical components and interfaces; optical transmission and reception techniques; wavelength division multiplexing; network architectures and protocol for first generation, single and multihop optical network; routing and wavelength assignment in second generation wavelength routing networks; traffic grooming, optical network control; survivability; access networks; metro networks.

**CPR E 543: Wireless Network Architecture**

(3-0) Cr. 3.

*Prereq: Credit or enrollment in CPR E 489 or CPR E 530*

Introduction to the protocol architecture of the data link layer, network layer and transport layer for wireless networking. Operation and management of Medium Access Control in Wireless Local Area Networks (WLAN) and Wireless Metropolitan Area Networks (WMAN); recent developments in IEEE 802.11 & 802.16 and Bluetooth; Mobile IP; Mobile TCP.

**CPR E 544: Fundamentals of Bioinformatics**

(Cross-listed with BCB, COM S, GDCB). (4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: MATH 165 or STAT 401 or equivalent*

A practical, hands-on overview of how to apply bioinformatics to biological research. Recommended for biologists desiring to gain computational molecular biology skills. Topics include: sequence analysis, genomics, proteomics, phylogenetic analyses, ontology enrichment, systems biology, data visualization and emergent technologies.

**CPR E 545: Fault-Tolerant Systems**

(3-0) Cr. 3.

*Prereq: CPR E 381*

Faults and their manifestations, errors, and failures; fault detection, location and reconfiguration techniques; time, space, and information (coding) redundancy management; design for testability; self-checking and fail-safe circuits; system-level fault diagnosis; Byzantine agreement; stable storage and RAID; clock synchronization; fault-tolerant networks; fault tolerance in real-time systems; reliable software design; checkpointing and rollback recovery; atomic actions; replica management protocols; and reliability evaluation techniques and tools.

**CPR E 546: Wireless and Sensor Networks**

(3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Fundamental and well-known protocols for wireless ad hoc and sensor networks at various layers, including physical layer issues, MAC (medium access control) layer protocols, routing protocols for wireless ad hoc and sensor networks, data management in sensor networks, coverage and connectivity, localization and tracking, security and privacy issues. Introduction to TinyOS and the nesC language. Hands-on experiments with Crossbow Mote sensor devices.

**CPR E 547: Resource Allocation in Communication Networks**

(3-0) Cr. 3.

Analytical approach to resource allocation on communication networks (e.g. the Internet, multihop wireless networks, etc.). Network utility maximization and the internet congestion control algorithm. Layering as optimization decomposition: a cross-layer design approach in multihop wireless networks. Capacity of ad hoc wireless networks.

**CPR E 548: Cyber-Physical Systems Networking**

Cr. 3.

*Prereq: CPR E 489; CPR E 530/430; COM S 486, or equivalent.*

Cyber-physical systems applications in smart agriculture, transportation, power grid, manufacturing, public safety, health systems, etc.; field area and control networks; industrial Ethernet; time-triggered communication; real-time wireless networks; wireless industrial networks; safety and security of industrial networks; systems platforms for cyber-physical systems networks; team-based learning/projects.

**CPR E 550: Distributed Systems and Middleware**

(Dual-listed with CPR E 450). (3-0) Cr. 3.

*Prereq: CPR E 308 or COM S 352*

Fundamentals of distributed computing, software agents, naming services, distributed transactions, security management, distributed object-based systems, web-based systems, Blockchain, middleware-based application design and development, case studies of middleware and internet applications.

**CPR E 554: Distributed Systems**

(Dual-listed with CPR E 454). (Cross-listed with COM S). (3-1) Cr. 3.

*Prereq: COM S 311; COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor*

Theoretical and practical issues of design and implementation of distributed systems. The client server paradigm, inter-process communications, synchronization and concurrency control, naming, consistency and replication, fault tolerance, and distributed file systems. Graduate credit requires additional in-depth study of concepts. Programming projects and written reports.

**CPR E 556: Scalable Software Engineering**

(3-0) Cr. 3.

*Prereq: COM S 309*

Design and analysis techniques scalable to large software, project-based learning of problem solving techniques, automation tools for high productivity and reliability of software, analysis-based measurement and estimation techniques for predictable software engineering.

**CPR E 557: Computer Graphics and Geometric Modeling**

(Cross-listed with COM S, M E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 421 or instructor permission*

Fundamentals of computer graphics technology. Data structures. Parametric curve and surface modeling. Solid model representations. Applications in engineering design, analysis, and manufacturing.

**CPR E 558: Real Time Systems**

(Dual-listed with CPR E 458). (3-0) Cr. 3.

*Prereq: CPR E 308 or COM S 352*

Fundamental concepts in real-time systems. Real time task scheduling paradigms. Resource management in uniprocessor, multiprocessor, and distributed real-time systems. Energy management in real-time systems and sensor networks. Fault-tolerance and overload handling in real-time systems. Real-time channel, QoS routing, traffic policing, packet scheduling, and real-time LAN protocols. Case study of real-time and IoT applications. Term project in real-time systems and networks.

**CPR E 559: Security and Privacy in Cloud Computing**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: COM S 352 or CPR E 308*

Introduction to cloud computing concepts and systems. Security and privacy threats in cloud computing. Practical techniques for cloud computing security. Theoretical and practical solutions for secure outsourcing of data and computation. Oral presentations and research projects.

**CPR E 560: Data-Driven Security and Privacy**

(Cross-listed with COM S, CYBSC). Cr. 3. Alt. S., offered irregularly.

*Prereq:* CPR E 531; COM S 474 or COM S 573

Examination of applications of machine learning and big data techniques to various security and privacy problems, as well as secure and privacy-preserving machine learning algorithms.

**CPR E 562: Secure Software Engineering**

(3-0) Cr. 3. F.S.

*Prereq:* CPR E 308 or COM S 352

Fundamentals and techniques to design and implement software systems. Assessment of security vulnerabilities in software systems, exploitation of software vulnerabilities, and methods to secure vulnerable software. Secure coding practices, data analytics for security, microservices and cloud services security. Reverse engineering and security assessment of cyber-physical systems.

**CPR E 563: Advanced Data Storage Systems**

(3-0) Cr. 3.

*Prereq:* CPR E 308 OR COM S 352

Focus on how to keep valuable digital data (e.g., scientific computations, financial transactions, family photos) safely in modern computer systems. Fundamentals of data storage technologies including state of the art. Topics include storage hardware, Linux file systems, and warehouse-scale big data storage, with an emphasis on the design tradeoffs for robustness and security. Team projects based on high-impact open-source systems.

**CPR E 566: Physical Design of VLSI Systems**

(3-0) Cr. 3.

*Prereq:* CPR E 465

Physical design of VLSI systems. Partitioning algorithms. Placement and floorplanning algorithms. Routing-global and detailed. Layout compaction. Physical design of FPGA's and MCM's. Performance-driven layout synthesis.

**CPR E 567: Bioinformatics Algorithms**

(Cross-listed with BCB, COM S). (3-0) Cr. 3.

*Prereq:* COM S 228; COM S 230; credit or enrollment in BIOL 315, STAT 430

Biology as an information science. A review of the algorithmic principles that are driving the advances in bioinformatics and computational biology.

**CPR E 569: Structural Bioinformatics**

(Cross-listed with BBMB, BCB, COM S, GDCB). (3-0) Cr. 3. F.

*Prereq:* BCB 567, BBMB 316, GEN 409, STAT 430

Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.

**CPR E 570: Systems Biology**

(Cross-listed with BCB, COM S, GDCB, STAT). (3-0) Cr. 3. S.

*Prereq:* BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430 or STAT 483 or STAT 583

Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

**CPR E 575: Computational Perception**

(Cross-listed with COM S, HCI). (3-0) Cr. 3. S.

*Prereq:* Graduate standing or permission of instructor

Statistical and algorithmic methods for sensing, recognizing, and interpreting the activities of people by a computer. Focuses on machine perception techniques that facilitate and augment human-computer interaction. Introduce computational perception on both theoretical and practical levels. Participation in small groups to design, implement, and evaluate a prototype of a human-computer interaction system that uses one or more of the techniques covered in the lectures.

**CPR E 580: Graphics Processing and Architecture**

(Dual-listed with CPR E 480). (3-3) Cr. 4. S.

*Prereq:* CPR E 381 or COM S 321

Introduction to hardware architectures for computer graphics and their programming models. System-level view, including framebuffers, video output devices, displays, 2D and 3D graphics acceleration, and device interfacing. Architectural design of GPUs, from 2D and 3D sprite engines to 3D rendering pipelines to unified shader architectures. Computing models for graphics processors. GPGPU and GPU computing.



**CPR E 581: Computer Systems Architecture**

(Cross-listed with COM S). (3-0) Cr. 3. F.

*Prereq: CPR E 381*

Quantitative principles of computer architecture design, instruction set design, processor architecture: pipelining and superscalar design, instruction level parallelism, memory organization: cache and virtual memory systems, multiprocessor architecture, cache coherency, interconnection networks and message routing, I/O devices and peripherals.

**CPR E 582: Computer Systems Performance**

(3-0) Cr. 3.

*Prereq: CPR E 381, CPR E 310 and STAT 330*

Review of probability and stochastic processes concepts; Markovian processes; Markovian queues; renewal theory; semi-Markovian queues; queueing networks, applications to multiprocessor architectures, computer networks, and switching systems.

**CPR E 583: Reconfigurable Computing Systems**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: Background in computer architecture, design, and organization*

Introduction to reconfigurable computing, FPGA technology and architectures, spatial computing architectures such as systolic and bit serial adaptive network architectures, static and dynamic rearrangeable interconnection architectures, processor architectures incorporating reconfigurability.

**CPR E 584: Models and Techniques in Embedded Systems**

(3-0) Cr. 3.

Industry-standard tools and optimization strategies; practical embedded platforms and technology (reconfigurable platforms, multi-core platforms, low-power platforms); instruction augmentation, memory-mapped accelerator design, embedded software optimization. Students will be encouraged to compete as teams in an embedded system design competition.

**CPR E 585: Developmental Robotics**

(Cross-listed with HCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: knowledge of C/C++ programming language.*

An introduction to the emerging interdisciplinary field of Developmental Robotics, which crosses the boundaries between robotics, artificial intelligence, developmental psychology, and philosophy. The main goal of this field is to create autonomous robots that are more intelligent, more adaptable, and more useful than the robots of today, which can only function in very limited domains and situations.

**CPR E 586: Pervasive Computing**

(3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Fundamentals of pervasive computing, including location and context awareness, mobile and location services, ubiquitous data access, low power computing and energy management, middleware, security and privacy issues.

**CPR E 588: Embedded Computer Systems**

(3-0) Cr. 3.

*Prereq: CPR E 308*

Hardware/software systems and codesign. Models of computation for embedded systems. System-level design. Modeling, specification, synthesis, and verification. Hardware/software implementation. Design space exploration. Performance analysis and optimization. Multiprocessor system on chip. Platform-based design. Design methodologies and tools. Case studies and design projects.

**CPR E 590: Special Topics**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in computer engineering.

**CPR E 592: Seminar in Computer Engineering**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

Projects or seminar in Computer Engineering.

**CPR E 595: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

Investigation of an approved topic commensurate with the student's prerequisites.

**CPR E 598: Electrical and Computer Engineering Learning Community Seminar**

(Cross-listed with E E). Cr. R. F.S.

*Prereq: Electrical and Computer Engineering Graduate Student*

Introduction to graduate study in Electrical and Computer Engineering at Iowa State University. Building networks, introduction to core requirements, and tools and techniques for success. Offered on a satisfactory-fail basis only. ECpE

**CPR E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**



**CPR E 626: Parallel Algorithms for Scientific Applications**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: CPR E 526*

Algorithm design for high-performance computing. Parallel algorithms for multidimensional tree data structures, space-filling curves, random number generation, graph partitioning and load balancing. Applications to grid and particle-based methods and computational biology.

**CPR E 631: Cyber Security Operations Practicum**

(Cross-listed with CYBSC). Cr. 3. Repeatable.

*Prereq: CPR E 532; CPR E 534; and permission of instructor*

Practical experience in cyber operations. Cyber security threat analysis, malware analysis, and intrusion detection management. Cyber security data analysis methods. Pen testing tools and techniques. Weekly threat analysis briefings. Offered on a satisfactory-fail basis only.

**CPR E 632: Cyber Security Capstone Design**

(Cross-listed with CYBSC). (3-0) Cr. 3.

*Prereq: CYBSC 531, CYBSC 532, CYBSC 534*

Capstone design course which integrates the security design process. Design of a security policy. Creation of a security plan. Implementation of the security plan. The students will attack each other's secure environments in an effort to defeat the security systems. Students evaluate the security plans and the performance of the plans. Social, political and ethics issues. Student self-evaluation, journaling, final written report.

**CPR E 649: Advanced Topics in Computational Biology**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: COM S 511 and COM S 531*

Design and analysis of algorithms for applications in computational biology, pairwise and multiple sequence alignments, approximation algorithms, string algorithms including in-depth coverage of suffix trees, semi-numerical string algorithms, algorithms for selected problems in fragment assembly, phylogenetic trees and protein folding. No background in biology is assumed. Also useful as an advanced algorithms course in string processing.

**CPR E 681: Advanced Topics in Computer Architecture**

(Cross-listed with COM S). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: CPR E 581. Repeatable with Instructor permission*

Current topics in computer architecture design and implementation. Advanced pipelining, cache and memory design techniques. Interaction of algorithms with architecture models and implementations. Tradeoffs in architecture models and implementations.

**CPR E 697: Engineering Internship**

(Cross-listed with E E). Cr. R. Repeatable.

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**CPR E 699: Research**

Cr. arr. Repeatable.

## Computer Science (COM S)

***Any experimental courses offered by COM S can be found at:***

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****COM S 101: Orientation**

Cr. R. F.S.

Required orientation class for all incoming students in the Computer Science major. Topics include academic planning and policies, campus resources, and supports. Opportunity to connect with other computer science peers, faculty, alumni, and employers. Offered on a satisfactory-fail basis only.

**COM S 103: Computer Literacy and Applications**

Cr. 4. F.S.SS.

Introduction to computer literacy and applications. Literacy: Impact of computer technology in today's societies, hardware, software, software programming, database and information systems, communication and networks, digital media technology, computer security and safety, ethics and privacy. Applications: In-depth hands-on experience with the operating systems, Microsoft word processing, spreadsheets, database management and presentation software. No prior computer experience necessary. Offered online only.

**COM S 104: Brief Introduction to Computer Programming for Non-Majors**

(1.5-1) Cr. 2. F.S.

Offered first 8 weeks and last 8 weeks. Use of personal computer and workstation and beginning programming. Project-oriented approach to computer operation and programming, including use of tools to aid in programming. Topics from computer history, using basic Windows and MacOS tools, program structure, expression, variables, decision and logic, and iteration. No prior computer experience necessary.

**COM S 105: Short Course in Computer Programming**

Cr. 2.

*Prereq: Com S 104*

8-week course in programming, including instruction in syntax and semantics, of the following current programming languages.

**COM S 105A: Short Course in Computer Programming: Perl**

(1-2) Cr. 2.

*Prereq: Com S 104*

8-week course in programming using Perl.

**COM S 105B: Short Course in Computer Programming: MATLAB**

(2-0) Cr. 2.

*Prereq: Com S 104*

8-week course in programming using MATLAB.

**COM S 106: Introduction to Web Programming**

(3-0) Cr. 3. F.S.

Introduction to web programming basics. Fundamentals of developing web pages using a comprehensive web development life cycle. Learn to design and code practical real-world homepage programs and earn adequate experience with current web design techniques such as HTML5 and cascading style sheets. Students also learn additional programming languages including JavaScript, jQuery, PHP, SQL, and MySQL. Strategies for accessibility, usability and search engine optimization. No prior computer programming experience necessary.

**COM S 107: Windows Application Programming**

(3-0) Cr. 3. F.S.

Introduction to computer programming for non-majors using a language such as the Visual Basic language. Basics of good programming and algorithm development. Graphical user interfaces.

**COM S 113: Introduction to Spreadsheets and Databases**

(2-2) Cr. 3. F.S.SS.

Using Microsoft Excel spreadsheets and Microsoft Access databases to input, store, process, manipulate, query, and analyze data for business and industrial applications. Credit in Com S 113 may not be applied toward graduation in the S E and CPR E majors.

**COM S 127: Introduction to Computer Programming**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 140 or higher*

Introduction to computer programming with an emphasis on problem-solving. Topics include: program structures, expressions, variables, decision and logic, iteration, collections, input, and output. Program construction and testing. Programming assignments including games and applications. No prior programming experience necessary.

**COM S 192: Explorations in Computing Research I**

Cr. 1. Repeatable, maximum of 2 credits. F.S.

Explore research opportunities for undergraduate students in Computer Science; understanding the nature of research and development process; reviewing the literature; development of writing, presentation, and data reporting skills; rotation under different research labs; group work.

**COM S 203: Careers in Computer Science**

Cr. R. F.S.

Computer science as a profession. Introduction to career fields open to computer science majors. Relationship of coursework to careers. Presentations by computer science professionals. Offered on a satisfactory-fail basis only.

**COM S 207: Fundamentals of Computer Programming**

(3-1) Cr. 3. F.S.SS.

*Prereq: MATH 150 or placement into MATH 140 or higher*

An introduction to computer programming using an object-oriented programming language. Emphasis on the basics of good programming techniques and style. Extensive practice in designing, implementing, and debugging small programs. Use of variable, if-statement, looping, method, and class. Interactive and file I/O. This course is not designed for computer science, software engineering, and computer engineering majors. Credit may not be applied toward graduation for both COM S 207 and COM S 227.

**COM S 227: Object-oriented Programming**

(3-2) Cr. 4. F.S.SS.

*Prereq: Credit or concurrent enrollment in MATH 143 or higher; (COM S 127 or CPR E 185 or S E 185 or E E 285)*

Computer programming using objects as the mechanism for modularity, abstraction, and code reuse. Instance variables, methods, and encapsulation. Review of control structures for conditionals and iteration. Developing algorithms on strings, arrays, and lists. Recursion, searching, and sorting. Text parsing and file I/O. Interfaces, inheritance, polymorphism, and abstract classes. Exception handling. Tools for unit testing and debugging. Emphasis on a disciplined approach to specification, code development, and testing. Course intended for majors in computer science and related fields. Credit may not be applied toward graduation for both Com S 207 and 227.

**COM S 228: Introduction to Data Structures**

(3-1) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in COM S 227; credit or concurrent enrollment in MATH 165*

An object-oriented approach to data structures and algorithms. Object-oriented analysis, design, and programming, with emphasis on data abstraction, inheritance and subtype polymorphism, and generics. Abstract data type specification and correctness. Collections including lists, stacks, queues, trees, heaps, maps, hash tables, and graphs. Big-O notation and algorithm analysis. Searching and sorting. Graph search and shortest path algorithms. Emphasis on object-oriented design, writing and documenting medium-sized programs. This course is designed for majors.

**COM S 230: Discrete Computational Structures**

(Cross-listed with MATH). (3-1) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in (COM S 227; MATH 165); ENGL 150*

Concepts in discrete mathematics as applied to computer science. Logic, set theory, functions, relations, cardinality of sets, combinatorics, graph theory and number theory. Proof techniques, induction and recursion.

**COM S 252: Linux Operating System Essentials**

(3-0) Cr. 3. F.

*Prereq: CPR E 185 or S E 185 or COM S 127 or COM S 207 or COM S 227*

Introduction to installation, utilization, and administration of Linux systems. Topics include open-source software, package installation and management, shell programming and command-line utilities, process and service management, account management, network configuration, file sharing, interoperation with other computers and operating systems, automation, and system security.

**COM S 290: Independent Study**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

No more than 6 credits of Com S 290 or Com S 290H may be counted toward graduation.

**COM S 290H: Independent Study: Honors**

Cr. arr. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

No more than 6 credits of Com S 290 or Com S 290H may be counted toward graduation.

**COM S 295: Programming-based problem solving practices**

Cr. 1. Repeatable, maximum of 3 times. F.S.

*Prereq: COM S 207 or COM S 227*

Basics of problem solving using programming techniques. Development and implementation of simple to advanced data structures and algorithms, evaluation of problem difficulty, design and implementation of solutions, debugging, and working under time pressure. Offered on a satisfactory-fail basis only.

**COM S 309: Software Development Practices**

(Cross-listed with S E). (3-1) Cr. 3. F.S.

*Prereq: Minimum of C- in (COM S 228; MATH 165)*

Practical introduction to methods for managing software development. Software engineering concepts, practices and tools. Requirements analysis, structured and object-oriented design, coding, testing, and maintenance. Software process models, software tools and environments. Programming projects that provide exposure to information management techniques, client/server model, networking and communication.

**COM S 311: Introduction to the Design and Analysis of Algorithms**

(3-1) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in (COM S 228; MATH 166, ENGL 150); (COM S 230 or CPR E 310)*

Basic techniques for design and analysis of algorithms. Sorting, searching, graph algorithms, string matching, algorithms for secure computing such as RSA, and NP-completeness. Design techniques such as dynamic programming, divide and conquer, greedy method, and approximation. Asymptotic, worst-case, average-case and amortized analyses. Topics from advanced data structures such as balanced trees and hashing. Programming projects.

**COM S 319: Construction of User Interfaces**

(Cross-listed with S E). (3-0) Cr. 3. F.S.

*Prereq: COM S 228*

Overview of user interface design. Evaluation and testing of user interfaces. Review of principles of object orientation, object oriented design and analysis using UML in the context of user interface design. Design of windows, menus and commands. Developing Web and Windows-based user-interfaces. Event-driven programming. Introduction to Frameworks and APIs for the construction of user interfaces.

**COM S 321: Introduction to Computer Architecture and Machine-Level Programming**

(3-1) Cr. 3. F.S.

*Prereq: Minimum of C- in COM S 228 and MATH 165; COM S 230 or CPR E 281; ENGL 250*

Introduction to computer architecture and organization. Emphasis on evaluation of performance, instruction set architecture, datapath and control, memory-hierarchy design, and pipelining. Assembly language programming.

**COM S 326: C for Programmers**

Cr. 1. F.S.

*Prereq: Minimum of C- in COM S 228; COM S 230 or CPR E 310*

Half-semester course. Design and implementation of libraries and applications in C, for students with prior programming background. Emphasis on differences between C and other languages, including file I/O, string processing, memory management, and buffer overruns. Using build systems, debuggers, and other development tools. Programming projects.

**COM S 327: Advanced Programming Techniques**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in (COM S 228; MATH 165)*

Object-oriented programming experience using a language suitable for exploring advanced topics in programming. Topics include memory management, parameter passing, inheritance, compiling, debugging, and maintaining programs. Significant programming projects.

**COM S 331: Theory of Computing**

(Cross-listed with LING). (3-1) Cr. 3. F.S.

*Prereq:* Minimum of C- in (COM S 228; MATH 166; ENGL 250); (COM S 230 or CPR E 310)

Models of computation: finite state automata, pushdown automata and Turing machines. Study of grammars and their relation to automata. Limits of digital computation, unsolvability and Church-Turing thesis. Relations between classes of languages.

**COM S 336: Introduction to Computer Graphics**

(3-0) Cr. 3. F.

*Prereq:* COM S 327 or CPR E 288; concurrent enrollment in (MATH 207 or MATH 265 or MATH 317)

Programming interactive computer graphics systems using standard low-level libraries (such as OpenGL or DirectX) with an emphasis on 3D rendering. The graphics pipeline and programmable shaders. Coordinate systems and transformations in two and three dimensions. Homogeneous coordinates, viewing transformations and perspective. Euler angles and quaternions. Visible surface algorithms. Lighting models and shading. Texture mapping, bump mapping, reflection, elementary ray tracing. Offscreen buffers, render-to-texture and related techniques.

**COM S 342: Principles of Programming Languages**

(Cross-listed with S E). (3-1) Cr. 3. F.S.

*Prereq:* Minimum of C- in COM S 228 and MATH 165; COM S 230 or CPR E 310

Study of concepts in programming languages, especially functional programming concepts. Overview of major programming paradigms, their relationship, and tradeoffs among paradigms enabling sound choices of programming language for application-specific development. Programming projects.

**COM S 350: Number Theory**

(Cross-listed with MATH). (3-0) Cr. 3. S.

*Prereq:* COM S 230 or CPR E 310 or MATH 201

Divisibility, integer representations, primes and divisors, linear diophantine equations, congruences, and multiplicative functions. Applications to cryptography. Additional topics, chosen at the discretion of the instructor.

**COM S 352: Introduction to Operating Systems**

(3-1) Cr. 3. F.S.

*Prereq:* (COM S 321 or CPR E 381); (COM S 327 or CPR E 288); ENGL 250

Survey of operating systems; process management including scheduling and multithreading; memory management including virtual memory and paging; concurrency including mutual exclusion, synchronization, and deadlocks; persistent storage and file systems; principles and practices of secure computing including threats and access control; networking and distributed systems; virtualization. Programming projects.

**COM S 362: Object-Oriented Analysis and Design**

(Cross-listed with S E). (3-0) Cr. 3. F.S.

*Prereq:* Minimum of C- in (COM S 228; MATH 165); ENGL 250

Object-oriented requirements analysis and systems design. Analysis and design methodologies including use case and Unified Modeling Language (UML). Design principles, heuristics, and patterns. Architectural patterns and alternative programming paradigms. Group design and programming project.

**COM S 363: Introduction to Database Management Systems**

(3-0) Cr. 3. F.S.

*Prereq:* Minimum of C- in (COM S 228; MATH 165); ENGL 250

Data models and database design using entity relationship model. Database implementation with relational and graph database management systems (DBMS) and query languages. DBMS internals including basic concepts of database storage, indexing, query optimization, and concurrent control. Database application development. Programming Projects.

**COM S 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq:* Permission of department chair

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**COM S 401: Bioinformatics of Sequences**

(Cross-listed with BCBIO, BIOL, GEN). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* (BCBIO 322; [COM S 127 or COM S 227]; [MATH 160 or MATH 165]; [MATH 166 or STAT 301]; [STAT 101 or STAT 104 or STAT 330]) or Permission of Instructor

Application of computer science and statistics to molecular biology with a significant problem-solving component, including hands-on programming using Python to solve a variety of biological problems. String algorithms, sequence alignments, homology search, pattern discovery, genotyping, genome assembly, genome annotation, comparative genomics, protein structure.

**COM S 402: Computer Science Senior Project**

Cr. 2-3. Repeatable, maximum of 6 credits. F.S.

*Prereq:* COM S 309, COM S 311, COM S 321, COM S 331, and Senior Classification

Students work as individuals and teams to complete the planning, design, and implementation of a significant project in the topic area. Oral and written reports. Recommended final semester Senior year. No more than 6 credits of 402A, 402B, and 402C may be used toward graduation.

**COM S 402A: Computer Science Senior Project: Multimedia and Computer Gaming I**

Cr. 2-3. Repeatable, maximum of 6 credits. F.

*Prereq: COM S 309, COM S 311, COM S 321, COM S 331, and COM S 437, Senior Classification*

Students conceive, plan, architect and design a computer game. Student registered in this course will work with students in ARTIS 409. Oral and written reports. No more than 6 credits of 402A, 402B, and 402C may be used toward graduation.

**COM S 402B: Computer Science Senior Project: Multimedia and Computer Gaming II**

Cr. 2-3. Repeatable, maximum of 6 credits. S.

*Prereq: COM S 402A, Senior Classification*

Students implement, test, and present a completed production computer game. Students in this class will work with students in ARTIS 409. Oral and written reports. No more than 6 credits of 402A, 402B, and 402C may be used toward graduation.

**COM S 402C: Computer Science Senior Project: Project in Computer Science**

(0-3) Cr. 3. F.S.

*Prereq: COM S 309, COM S 311, COM S 321, COM S 331, and Senior Classification*

Students work as individuals and teams to complete the planning, design, and implementation of a significant project in the topic area. Oral and written reports. Recommended final semester Senior year. No more than 6 credits of 402A, 402B, and 402C may be used toward graduation.

**COM S 406: Bioinformatics of OMICS**

(Cross-listed with BCBIO, BIOL, GEN). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Introduction to cutting edge OMICS analyses including transcriptome, proteome, metabolome, DNA-protein interactome, protein-protein interactome and methylome. Genomic analysis including transcriptome analysis, cancer genomics, comparative genomics, and regulatory network analysis.

**COM S 407: Applied Formal Methods**

(Dual-listed with COM S 507). (Cross-listed with AER E). Cr. 3. S.

*Prereq: For AER E majors: AER E 361, For COM S majors: COM S 311, For other majors: AER E 361 or (COM S 311 or an equivalent course); Permission of Instructor*

Introduction to the fundamentals of formal methods, a set of mathematically rigorous techniques for the formal specification, validation, and verification of safety- and security-critical systems. Tools, techniques, and applications of formal methods with an emphasis on real-world use-cases such as enabling autonomous operation. Build experience in writing mathematically analyzable specifications from English operational concepts for real cyberphysical systems, such as aircraft and spacecraft. Review capabilities and limitations of formal methods in the design, verification, and system health management of today's complex systems.

**COM S 409: Software Requirements Engineering**

(Dual-listed with COM S 509). (3-0) Cr. 3.

*Prereq: COM S 309; for graduate credit: graduate standing or permission of instructor*

The requirements engineering process including elicitation, requirements analysis fundamentals, requirements specification and communication, and requirements evaluation. Modeling of functional and nonfunctional requirements, traceability, and requirements change management. Case studies and software projects.

**COM S 410: Distributed Development of Software**

(Dual-listed with COM S 510). (3-0) Cr. 3.

*Prereq: COM S 309; COM S 327 or CPR E 288; for graduate credit: graduate standing or permission of instructor*

Teams of students develop software applications in a modern software engineering environment. Importance, effective processes pertaining to team organization, management and communication, and cultural issues of distributed development. Graduate credit requires in-depth study of concepts and oral presentations.

**COM S 412: Formal Methods in Software Engineering**

(Dual-listed with COM S 512). (Cross-listed with CPR E, S E). (3-0) Cr. 3.

*Prereq: COM S 311; STAT 305 or STAT 330 or STAT 341; for graduate credit: graduate standing or permission of instructor*

A study of formal techniques for model-based specification and verification of software systems. Topics include logics, formalisms, graph theory, numerical computations, algorithms and tools for automatic analysis of systems. Graduate credit requires in-depth study of concepts.



**COM S 413: Program Analysis**

(Dual-listed with COM S 513). (Cross-listed with S E). (3-0) Cr. 3.

*Prereq: (COM S 327 or CPR E 288); COM S 342*

Algorithms, AI techniques and tools for automatically reasoning about code and program executions. Theory and foundations related to control flow analysis, dataflow analysis, abstract interpretation, and symbolic execution. Applications of program analysis to bug detection, test input generation, debugging, program repair, specification inference and trustworthy AI engineering. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

**COM S 414: Gerontechnology in Smart Home Environments**

(Dual-listed with COM S 514). (3-0) Cr. 3.

*Prereq: COM S 227 or COM S 207 or GERON 377 or ARTGR 271 or equivalent; for graduate credit: graduate standing or permission of instructor*

Interdisciplinary course designed for students interested in assistive technology, pervasive computing, mobile computing and principles of universal and inclusive design for end users, in particular, the elderly population. Students work in semester-long projects as interdisciplinary teams to apply knowledge obtained from lectures and mutual presentations. Research report and oral presentation required for graduate credit.

**COM S 415: Software System Safety**

(Dual-listed with COM S 515). (3-0) Cr. 3.

*Prereq: COM S 309 or COM S 311; for graduate credit: graduate standing or permission of instructor*

An introduction to the hazard analysis, safety requirements, design, and verification of software for safety-critical and high-dependability systems. Safety analysis techniques, fault identification and recovery, and certification issues. Emphasizes a case-based and systematic approach to software's role in safe systems.

**COM S 417: Software Testing**

(Cross-listed with S E). (3-0) Cr. 3.

*Prereq: COM S 309; (COM S 230 or CPR E 310); ENGL 250*

An introduction to software testing principles and techniques. Test models, test design, test adequacy criteria; regression, integration, and system testing; and software testing tools.

**COM S 418: Introduction to Computational Geometry**

(Dual-listed with COM S 518). (3-0) Cr. 3.

*Prereq: COM S 311; for graduate credit: graduate standing or permission of instructor*

Introduction to data structures, algorithms, and analysis techniques for computational problems that involve geometry. Convex hulls, line segment intersection, polygon triangulation, 2D linear programming, range queries, point location, arrangements and duality, Voronoi diagrams, Delaunay triangulations, geometric data structures, robot motion planning, visibility graphs. Other selected topics. Programming assignments. Scholarly report required for graduate credit.

**COM S 421: Logic for Mathematics and Computer Science**

(Cross-listed with MATH). (3-0) Cr. 3.

*Prereq: COM S 230 or CPR E 310 or MATH 207 or MATH 301 or MATH 317*

Propositional and predicate logic. Topics selected from Horn logic, equational logic, resolution and unification, foundations of logic programming, reasoning about programs, program specification and verification, model checking and binary decision diagrams, temporal logic and modal logic.

**COM S 424: Introduction to High Performance Computing**

(Cross-listed with CPR E, MATH). (2-2) Cr. 3. F.

*Prereq: (MATH 265; [MATH 207 or MATH 317]) or Permission of Instructor*

Unix, serial programming of scientific applications, OpenMP for shared-memory parallelization. No Unix, Fortran or C experience required.

**COM S 425: High Performance Computing for Scientific and Engineering Applications**

(Cross-listed with CPR E). (2-2) Cr. 3.

*Prereq: COM S 311; ENGL 250; SP CM 212*

Introduction to high performance computing platforms including parallel computers and workstation clusters. Discussion of parallel architectures, performance, programming models, and software development issues. Sample applications from science and engineering. Practical issues in high performance computing will be emphasized via a number of programming projects using a variety of programming models and case studies. Oral and written reports.

**COM S 426: Introduction to Parallel Algorithms and Programming**

(Dual-listed with COM S 526). (Cross-listed with CPR E). (3-2) Cr. 4. F.

*Prereq: (CPR E 308 or COM S 321); (CPR E 315 or COM S 311)*

Models of parallel computation, performance measures, basic parallel constructs and communication primitives, parallel programming using MPI, parallel algorithms for selected problems including sorting, matrix, tree and graph problems, fast Fourier transforms.



**COM S 430: Concurrent Programming in Practice**

(3-1) Cr. 3.

*Prereq: COM S 311; (COM S 362 or COM S 363); ENGL 250; SP CM 212*

A practical course in concepts, techniques, languages, and frameworks for concurrent and asynchronous systems. Concurrency fundamentals: threads, synchronization locks, waiting and notification, memory visibility. Immutability and thread confinement. Concurrent data structures and utilities, thread pools. Asynchronous programming with callbacks, futures, and message passing. Issues of aliasing, ownership and borrowing. Transactional memory, immutable and versioned data structures. Alternatives to threads and locks: event-driven systems, the actor model, CSP, coroutines. Students will investigate several non-mainstream languages supporting different concurrency models. Oral and written reports.

**COM S 433: Molecular Programming of Nanoscale Devices and Processes**

(Dual-listed with COM S 533). (3-0) Cr. 3.

*Prereq: Minimum of C- in COM S 331 or permission of instructor; for graduate credit: graduate standing or permission of instructor*

Programming, modeling, and analysis of natural and engineered systems at the nanoscale. Topics include chemical reaction networks, strand displacement systems, models of self-assembly, biomolecular origami, and molecular robotics. Emphasis on mathematical methods of describing, simulating, programming, and assessing the computational power of such systems. Graduate credit requires a written or oral report on current research.

**COM S 434: Quantum Information and Complexity**

(Dual-listed with COM S 534). (3-0) Cr. 3. F.

*Prereq: (COM S 331 or PHYS 422 or PHYS 522); (MATH 207 or MATH 317)*

An exploration of quantum information and computation from a theoretical computer science perspective. Topics include quantum circuits, axioms of quantum mechanics, quantum entanglement, quantum teleportation, nonlocal games, quantum entropies, quantum information theory, quantum computational complexity, interactive proof systems, and quantum supremacy.

**COM S 435: Algorithms for Large Data Sets: Theory and Practice**

(Dual-listed with COM S 535). (3-0) Cr. 3.

*Prereq: COM S 311 or equivalent; for graduate credit: graduate standing or permission of instructor*

Algorithmic challenges involved in solving computational problems on massive data sets. Probabilistic data structures, Curse of Dimensionality and dimensionality reduction, locality sensitive hashing, similarity measures, matrix decompositions. Optimization problems in massive data analysis. Computational problems that arise in the context of web search, social network analysis, online advertising etc. Practical aspects include implementation and performance evaluation of the algorithms on real world data sets. Graduate credit requires a written report on current research.

**COM S 437: Computer Game and Media Programming**

(3-0) Cr. 3.

*Prereq: COM S 336*

Video game programming using current game engine interfaces with real hardware. Particular attention is paid to the development environment, tool chains, 2D graphics, 3D graphics, controllers, memory management, and audio systems.

**COM S 440: Principles and Practice of Compiling**

(Dual-listed with COM S 540). (Cross-listed with S E). (3-1) Cr. 3.

*Prereq: COM S 331 or COM S 342; COM S 309; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Theory of compiling and implementation issues of programming languages. Programming projects leading to the construction of a compiler. Projects with different difficulty levels will be given for 440 and 540. Topics include: lexical, syntactic and semantic analyses, syntax-directed translation, code generation, runtime environment and library support.

**COM S 441: Programming Languages**

(Dual-listed with COM S 541). (3-1) Cr. 3.

*Prereq: COM S 342 or COM S 440; for graduate credit: graduate standing or permission of instructor*

Survey of the goals and problems of language design. Formal and informal studies of a wide variety of programming language features including type systems. Creative use of functional and declarative programming paradigms.

**COM S 453: Privacy Preserving Algorithms and Data Security**

Cr. 3. S.

*Prereq: COM S 311; (STAT 305 or STAT 330 or STAT 341 or STAT 347)*

Latest online threats on identity theft, fundamentals of privacy preserving algorithms, techniques, and mechanisms to minimize disclosure of sensitive information while maintaining availability. Theory and fundamentals underpinning measures to evaluate the privacy and availability of data; implementation and deployment of privacy-preserving data operations including pre- and post-randomization techniques, homomorphisms, and secure function evaluation protocols.

**COM S 454: Distributed Systems**

(Dual-listed with COM S 554). (Cross-listed with CPR E). (3-1) Cr. 3.

*Prereq: COM S 311; COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor*

Theoretical and practical issues of design and implementation of distributed systems. The client server paradigm, inter-process communications, synchronization and concurrency control, naming, consistency and replication, fault tolerance, and distributed file systems. Graduate credit requires additional in-depth study of concepts. Programming projects and written reports.

**COM S 455: Simulation: Algorithms and Implementation**

(Dual-listed with COM S 555). (3-0) Cr. 3.

*Prereq: COM S 311; STAT 305 or STAT 330 or STAT 341 or STAT 347; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Introduction to discrete-event simulation with a focus on computer science applications, including performance evaluation of networks and distributed systems. Overview of algorithms and data structures necessary to implement simulation software. Discrete and continuous stochastic models, random number generation, elementary statistics, simulation of queuing and inventory systems, Monte Carlo simulation, point and interval parameter estimation. Graduate credit requires additional in-depth study of concepts.

**COM S 461: Principles and Internals of Database Systems**

(3-1) Cr. 3.

*Prereq: COM S 311; ENGL 250; SP CM 212*

Database design including entity-relationship model, relational data model, and non-relational data models, data dependency, and normalization. Database management including physical storage, access methods, query processing, and transaction management. Database systems of special purposes such as spatial databases, mobile object databases, and multimedia databases. Introduction to current database research such as cloud data management and Internet information retrieval.

**COM S 472: Principles of Artificial Intelligence**

(Dual-listed with COM S 572). (3-1) Cr. 3.

*Prereq: COM S 311; STAT 330 or STAT 305 or STAT 341 or STAT 347; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Basic principles, techniques, and applications of artificial intelligence. Specification, design, implementation, and applications of intelligent agents. Computational models of intelligent behavior, including problem solving, knowledge representation and reasoning, planning, decision making, learning, perception, and communication. Artificial intelligence programming. Term project and written report for graduate credit.

**COM S 474: Introduction to Machine Learning**

(Dual-listed with COM S 574). (3-1) Cr. 3.

*Prereq: COM S 311; STAT 330 or STAT 305 or STAT 341 or STAT 347; MATH 165; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Introduction to concepts, tools and techniques of machine learning for applications. Selected machine learning algorithms in practical data mining tasks such as classification, regression, and clustering, e.g., association rules, decision trees, linear models, Bayesian learning, support vector machines, artificial neural networks, instance-based learning, probabilistic graphical models, ensemble learning, and clustering algorithms. Selected applications in data mining and pattern recognition.

**COM S 476: Motion Planning for Robotics and Autonomous Systems**

(Dual-listed with COM S 576). (3-0) Cr. 3.

*Prereq: COM S 311; ENGL 250*

Recent techniques for developing algorithms that automatically generate continuous motions while satisfying geometric constraints. Applications in areas such as robotics and autonomous systems. Discrete planning, kinematics, configuration space, collision detection, sampling-based motion planning, nonholonomic systems and differential constraints. Implementation of software that computes motion plans in Python. Written reports.

**COM S 477: Foundations of Robotics and Computer Vision**

(Dual-listed with COM S 577). (3-0) Cr. 3.

*Prereq: COM S 228; COM S 230 or CPR E 310; MATH 207 or MATH 317, or consent of the instructor; for graduate credit: graduate standing or permission of instructor*

Selected topics from applied mathematics, algorithms, geometry, and mechanics that are fundamental to robotics and computer vision, and are also applied in computer graphics, geometric modeling and visualization, to name a few. Homogeneous coordinates and transformations, perspective projection, camera calibration, rotations and quaternions, roots of polynomials and polynomial systems, solution of linear and nonlinear equations, parametric and algebraic curves, curvature, torsion, Frenet formulas, surfaces, fundamental forms, principal curvatures, Gaussian and mean curvatures, geodesics, approximation, Fourier series and fast Fourier transform, nonlinear optimization, Lagrange multipliers, least squares, surface fitting and calculus of variations. Programming components. Scholarly report required for graduate credit.

**COM S 481: Numerical Methods for Differential Equations**

(Cross-listed with MATH). (3-0) Cr. 3. S.

*Prereq: MATH 265; (MATH 266 or MATH 267)*

First order Euler method, high order Runge-Kutta methods, and multistep methods for solving ordinary differential equations. Finite difference and finite element methods for solving partial differential equations. Local truncation error, stability, and convergence for finite difference method. Numerical solution space, polynomial approximation, and error estimate for finite element method. Computer programming required.

**COM S 487: Introduction to Network Programming and Cloud Computing**

(Dual-listed with COM S 587). (3-0) Cr. 3.

*Prereq: COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor*

Introduction to network programming: protocols, programming suites, and applications. Introduction to cloud computing: concepts and case study with AWS. Introduction to selected research issues in networking and cloud computing. Graduate credit requires written report and oral presentation.

**COM S 488: Computer Networks**

(Dual-listed with COM S 588). (3-0) Cr. 3. F.Alt. S., offered irregularly.

*Prereq: COM S 352 or CPR E 308*

Fundamental concepts in the design and implementation of computer communication in both wired and wireless networks, their protocols, and applications. Topics include the layered network architecture in the Internet, applications, transport, network, and data link layers and their protocols, Socket API, software-defined networking, and network security. Lectures organized in a top-down approach to cover the layers of network design.

**COM S 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 6 credits in COM S; Permission of Instructor*

No more than 9 credits of Com S 490 or Com S 490H may be counted toward graduation.

**COM S 490H: Independent Study: Honors**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 6 credits in COM S; Permission of Instructor*

No more than 9 credits of Com S 490 or Com S 490H may be counted toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:****COM S 507: Applied Formal Methods**

(Dual-listed with COM S 407). (Cross-listed with AER E). Cr. 3. S.

*Prereq: For AER E majors: AER E 361, For COM S majors: COM S 311, For other majors: AER E 361 or (COM S 311 or an equivalent course); Permission of Instructor*

Introduction to the fundamentals of formal methods, a set of mathematically rigorous techniques for the formal specification, validation, and verification of safety- and security-critical systems. Tools, techniques, and applications of formal methods with an emphasis on real-world use-cases such as enabling autonomous operation. Build experience in writing mathematically analyzable specifications from English operational concepts for real cyberphysical systems, such as aircraft and spacecraft. Review capabilities and limitations of formal methods in the design, verification, and system health management of today's complex systems.

**COM S 509: Software Requirements Engineering**

(Dual-listed with COM S 409). (3-0) Cr. 3.

*Prereq: COM S 309; for graduate credit: graduate standing or permission of instructor*

The requirements engineering process including elicitation, requirements analysis fundamentals, requirements specification and communication, and requirements evaluation. Modeling of functional and nonfunctional requirements, traceability, and requirements change management. Case studies and software projects.

**COM S 510: Distributed Development of Software**

(Dual-listed with COM S 410). (3-0) Cr. 3.

*Prereq: COM S 309; COM S 327 or CPR E 288; for graduate credit: graduate standing or permission of instructor*

Teams of students develop software applications in a modern software engineering environment. Importance, effective processes pertaining to team organization, management and communication, and cultural issues of distributed development. Graduate credit requires in-depth study of concepts and oral presentations.

**COM S 511: Design and Analysis of Algorithms**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: COM S 311*

A study of algorithm design and analysis techniques. Network flows and linear programming. Randomized algorithms. NP-completeness. Approximation algorithms. Fixed-parameter algorithms.

**COM S 512: Formal Methods in Software Engineering**

(Dual-listed with COM S 412). (3-0) Cr. 3.

*Prereq: COM S 311; STAT 305 or STAT 330 or STAT 341; for graduate credit: graduate standing or permission of instructor*

A study of formal techniques for model-based specification and verification of software systems. Topics include logics, formalisms, graph theory, numerical computations, algorithms and tools for automatic analysis of systems. Graduate credit requires in-depth study of concepts.

**COM S 513: Program Analysis**

(Dual-listed with COM S 413). (Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: (COM S 327 or CPR E 288); COM S 342*

Algorithms, AI techniques and tools for automatically reasoning about code and program executions. Theory and foundations related to control flow analysis, dataflow analysis, abstract interpretation, and symbolic execution. Applications of program analysis to bug detection, test input generation, debugging, program repair, specification inference and trustworthy AI engineering. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

**COM S 514: Gerontechnology in Smart Home Environments**

(Dual-listed with COM S 414). (3-0) Cr. 3.

*Prereq: COM S 227 or COM S 207 or GERON 377 or ARTGR 271 or equivalent; for graduate credit: graduate standing or permission of instructor*

Interdisciplinary course designed for students interested in assistive technology, pervasive computing, mobile computing and principles of universal and inclusive design for end users, in particular, the elderly population. Students work in semester-long projects as interdisciplinary teams to apply knowledge obtained from lectures and mutual presentations. Research report and oral presentation required for graduate credit.

**COM S 515: Software System Safety**

(Dual-listed with COM S 415). (3-0) Cr. 3.

*Prereq: COM S 309 or COM S 311; for graduate credit: graduate standing or permission of instructor*

An introduction to the hazard analysis, safety requirements, design, and verification of software for safety-critical and high-dependability systems. Safety analysis techniques, fault identification and recovery, and certification issues. Emphasizes a case-based and systematic approach to software's role in safe systems.

**COM S 516: Artificial Intelligence in Software Engineering**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: COM S 311, COM S 309*

Application of artificial intelligence (AI) techniques used to solve problems in software engineering and the use of software engineering techniques to improve AI. AI techniques such as optimization/search, classification, natural language processing, and deep learning to address software engineering problems will be included.

**COM S 518: Introduction to Computational Geometry**

(Dual-listed with COM S 418). (3-0) Cr. 3.

*Prereq: COM S 311; for graduate credit: graduate standing or permission of instructor*

Introduction to data structures, algorithms, and analysis techniques for computational problems that involve geometry. Convex hulls, line segment intersection, polygon triangulation, 2D linear programming, range queries, point location, arrangements and duality, Voronoi diagrams, Delaunay triangulations, geometric data structures, robot motion planning, visibility graphs. Other selected topics. Programming assignments. Scholarly report required for graduate credit.

**COM S 525: Numerical Analysis of High Performance Computing**

(Cross-listed with CPR E, MATH). (3-0) Cr. 3. S.

*Prereq: CPR E 308 or MATH 481; experience in scientific programming; knowledge of FORTRAN or C*

Introduction to parallelization techniques and numerical methods for distributed memory high performance computers. A semester project in an area related to each student's research interests is required.

**COM S 526: Introduction to Parallel Algorithms and Programming**

(Dual-listed with COM S 426). (Cross-listed with CPR E). (3-2) Cr. 4. F.

*Prereq: (CPR E 308 or COM S 321); (CPR E 315 or COM S 311)*

Models of parallel computation, performance measures, basic parallel constructs and communication primitives, parallel programming using MPI, parallel algorithms for selected problems including sorting, matrix, tree and graph problems, fast Fourier transforms.

**COM S 527: Concurrent Systems**

(Cross-listed with CPR E). Cr. 3.

*Prereq: COM S 352 or CPR E 308*

Fundamentals and advances in concurrent systems in the context of GPUs, TPUs, multicore and HPC systems with specific focus on parallel programming models. Discussion of high-performance computing, GPGPU, scaling deep neural network training and machine learning algorithms, high-performance deep learning, engineering parallel software and and parallel design patterns.

**COM S 531: Theory of Computation**

(3-0) Cr. 3.

*Prereq: COM S 331*

A systematic study of the fundamental models and analytical methods of theoretical computer science. Computability, the Church-Turing thesis, decidable and undecidable problems. Computational resources such as time, space, and nonuniformity. Complexity classes, computational intractability and completeness. Selected topics from randomness, algorithmic information theory, and logic.

**COM S 533: Molecular Programming of Nanoscale Devices and Processes**

(Dual-listed with COM S 433). (3-0) Cr. 3.

*Prereq: Minimum of C- in COM S 331 or permission of instructor; for graduate credit: graduate standing or permission of instructor*

Programming, modeling, and analysis of natural and engineered systems at the nanoscale. Topics include chemical reaction networks, strand displacement systems, models of self-assembly, biomolecular origami, and molecular robotics. Emphasis on mathematical methods of describing, simulating, programming, and assessing the computational power of such systems. Graduate credit requires a written or oral report on current research.

**COM S 534: Quantum Information and Complexity**

(Dual-listed with COM S 434). (3-0) Cr. 3. F.

*Prereq: (COM S 331 or PHYS 422 or PHYS 522); (MATH 207 or MATH 317)*

An exploration of quantum information and computation from a theoretical computer science perspective. Topics include quantum circuits, axioms of quantum mechanics, quantum entanglement, quantum teleportation, nonlocal games, quantum entropies, quantum information theory, quantum computational complexity, interactive proof systems, and quantum supremacy.

**COM S 535: Algorithms for Large Data Sets: Theory and Practice**

(Dual-listed with COM S 435). (3-0) Cr. 3.

*Prereq: COM S 311 or equivalent; for graduate credit: graduate standing or permission of instructor*

Algorithmic challenges involved in solving computational problems on massive data sets. Probabilistic data structures, Curse of Dimensionality and dimensionality reduction, locality sensitive hashing, similarity measures, matrix decompositions. Optimization problems in massive data analysis. Computational problems that arise in the context of web search, social network analysis, online advertising etc. Practical aspects include implementation and performance evaluation of the algorithms on real world data sets. Graduate credit requires a written report on current research.

**COM S 540: Principles and Practice of Compiling**

(Dual-listed with COM S 440). (3-1) Cr. 3.

*Prereq: COM S 331 or COM S 342; COM S 309; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Theory of compiling and implementation issues of programming languages. Programming projects leading to the construction of a compiler. Projects with different difficulty levels will be given for 440 and 540. Topics include: lexical, syntactic and semantic analyses, syntax-directed translation, code generation, runtime environment and library support.

**COM S 541: Programming Languages**

(Dual-listed with COM S 441). (3-1) Cr. 3.

*Prereq: COM S 342 or COM S 440; for graduate credit: graduate standing or permission of instructor*

Survey of the goals and problems of language design. Formal and informal studies of a wide variety of programming language features including type systems. Creative use of functional and declarative programming paradigms.

**COM S 544: Fundamentals of Bioinformatics**

(Cross-listed with BCB, CPR E, GDCB). (4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: MATH 165 or STAT 401 or equivalent*

A practical, hands-on overview of how to apply bioinformatics to biological research. Recommended for biologists desiring to gain computational molecular biology skills. Topics include: sequence analysis, genomics, proteomics, phylogenetic analyses, ontology enrichment, systems biology, data visualization and emergent technologies.

**COM S 551: Genomic Data Science**

(3-0) Cr. 3.

*Prereq: COM S 311*

Introduction to a big data research area in bioinformatics. Focus on applying computational techniques to huge genomic sequence data. These techniques include finding optimal sequence alignments, generating genome assemblies, finding genes in genomic sequences, mapping short sequences onto a genome assembly, finding single-nucleotide and structural variations, building phylogenetic trees from genome sequences, and performing genome-wide association studies.



**COM S 552: Principles of Operating Systems**

(3-0) Cr. 3.

*Prereq: For graduate credit: graduate standing or permission of instructor*

A comparative study of high-level language facilities for process synchronization and communication. Analysis of deadlock, concurrency control and recovery. Protection issues including capability-based systems, access and flow control, encryption, and authentication. Additional topics chosen from distributed operating systems, soft real-time operating systems, and advanced security issues. Programming and research projects.

**COM S 554: Distributed Systems**

(Dual-listed with COM S 454). (Cross-listed with CPR E). (3-1) Cr. 3.

*Prereq: COM S 311; COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor*

Theoretical and practical issues of design and implementation of distributed systems. The client server paradigm, inter-process communications, synchronization and concurrency control, naming, consistency and replication, fault tolerance, and distributed file systems. Graduate credit requires additional in-depth study of concepts. Programming projects and written reports.

**COM S 555: Simulation: Algorithms and Implementation**

(Dual-listed with COM S 455). (3-0) Cr. 3.

*Prereq: COM S 311; STAT 305 or STAT 330 or STAT 341 or STAT 347; ENGL 250; for graduate credit: graduate standing or permission of instructor*

Introduction to discrete-event simulation with a focus on computer science applications, including performance evaluation of networks and distributed systems. Overview of algorithms and data structures necessary to implement simulation software. Discrete and continuous stochastic models, random number generation, elementary statistics, simulation of queuing and inventory systems, Monte Carlo simulation, point and interval parameter estimation. Graduate credit requires additional in-depth study of concepts.

**COM S 557: Computer Graphics and Geometric Modeling**

(Cross-listed with CPR E, M E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 421 or instructor permission*

Fundamentals of computer graphics technology. Data structures. Parametric curve and surface modeling. Solid model representations. Applications in engineering design, analysis, and manufacturing.

**COM S 559: Security and Privacy in Cloud Computing**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: COM S 352 or CPR E 308*

Introduction to cloud computing concepts and systems. Security and privacy threats in cloud computing. Practical techniques for cloud computing security. Theoretical and practical solutions for secure outsourcing of data and computation. Oral presentations and research projects.

**COM S 560: Data-Driven Security and Privacy**

(Cross-listed with CPR E, CYBSC). Cr. 3. Alt. S., offered irregularly.

*Prereq: CPR E 531; COM S 474 or COM S 573*

Examination of applications of machine learning and big data techniques to various security and privacy problems, as well as secure and privacy-preserving machine learning algorithms.

**COM S 561: Database Design, Management, and Research**

(3-0) Cr. 3.

*Prereq: COM S 311 or permission of instructor*

Database design including entity-relationship model, relational data model, and non-relational data models, data dependency, and normalization. Database management including physical storage, access methods, query processing, and transaction management. Database systems of special purposes such as spatial databases, mobile object databases, and multimedia databases. Introduction to current database research such as cloud data management and Internet information retrieval. Significant work on reading and presentation of research publications.

**COM S 567: Bioinformatics Algorithms**

(Cross-listed with BCB, CPR E). (3-0) Cr. 3.

*Prereq: COM S 228; COM S 230; credit or enrollment in BIOL 315, STAT 430*

Biology as an information science. A review of the algorithmic principles that are driving the advances in bioinformatics and computational biology.

**COM S 568: Statistical Bioinformatics**

(Cross-listed with BCB, GDCB, STAT). (3-0) Cr. 3. S.

*Prereq: BCB 567 or (BIOL 315 and one of STAT 430 or STAT 483 or STAT 583), credit or enrollment in GEN 409*

Statistical models for sequence data, including applications in genome annotation, motif discovery, variant discovery, molecular phylogeny, gene expression analysis, and metagenomics. Statistical topics include model building, inference, hypothesis testing, and simple experimental design, including for big data/complex models.



**COM S 569: Structural Bioinformatics**

(Cross-listed with BBMB, BCB, CPR E, GDCB). (3-0) Cr. 3. F.

*Prereq:* BCB 567, BBMB 316, GEN 409, STAT 430

Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.

**COM S 570: Systems Biology**

(Cross-listed with BCB, CPR E, GDCB, STAT). (3-0) Cr. 3. S.

*Prereq:* BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430 or STAT 483 or STAT 583

Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

**COM S 572: Principles of Artificial Intelligence**

(Dual-listed with COM S 472). (3-1) Cr. 3.

*Prereq:* COM S 311; STAT 330 or STAT 305 or STAT 341 or STAT 347; ENGL 250; for graduate credit: graduate standing or permission of instructor

Basic principles, techniques, and applications of artificial intelligence. Specification, design, implementation, and applications of intelligent agents. Computational models of intelligent behavior, including problem solving, knowledge representation and reasoning, planning, decision making, learning, perception, and communication. Artificial intelligence programming. Term project and written report for graduate credit.

**COM S 573: Machine Learning**

(3-1) Cr. 3.

*Prereq:* Graduate standing or permission of instructor

Basic principles, techniques, and applications of machine learning. Design, analysis, theoretical foundation, implementation, and applications of learning algorithms. Selected machine learning techniques in supervised learning, unsupervised learning, and reinforcement learning, including Bayesian decision theory, computational learning theory, decision trees, linear models, support vector machines, artificial neural networks, instance-based learning, probabilistic graphical models, ensemble learning, clustering algorithms, dimensionality reduction and feature selection. Selected applications in data mining and pattern recognition.

**COM S 574: Introduction to Machine Learning**

(Dual-listed with COM S 474). (3-1) Cr. 3.

*Prereq:* COM S 311; STAT 330 or STAT 305 or STAT 341 or STAT 347; MATH 165; ENGL 250; for graduate credit: graduate standing or permission of instructor

Introduction to concepts, tools and techniques of machine learning for applications. Selected machine learning algorithms in practical data mining tasks such as classification, regression, and clustering, e.g., association rules, decision trees, linear models, Bayesian learning, support vector machines, artificial neural networks, instance-based learning, probabilistic graphical models, ensemble learning, and clustering algorithms. Selected applications in data mining and pattern recognition.

**COM S 575: Computational Perception**

(Cross-listed with CPR E, HCI). (3-0) Cr. 3. S.

*Prereq:* Graduate standing or permission of instructor

Statistical and algorithmic methods for sensing, recognizing, and interpreting the activities of people by a computer. Focuses on machine perception techniques that facilitate and augment human-computer interaction. Introduce computational perception on both theoretical and practical levels. Participation in small groups to design, implement, and evaluate a prototype of a human-computer interaction system that uses one or more of the techniques covered in the lectures.

**COM S 576: Motion Planning for Robotics and Autonomous Systems**

(Dual-listed with COM S 476). (3-0) Cr. 3.

*Prereq:* COM S 311; ENGL 250

Recent techniques for developing algorithms that automatically generate continuous motions while satisfying geometric constraints. Applications in areas such as robotics and autonomous systems. Discrete planning, kinematics, configuration space, collision detection, sampling-based motion planning, nonholonomic systems and differential constraints. Implementation of software that computes motion plans in Python. Written reports.

**COM S 577: Foundations of Robotics and Computer Vision**

(Dual-listed with COM S 477). (3-0) Cr. 3.

*Prereq: COM S 228; COM S 230 or CPR E 310; MATH 207 or MATH 317, or consent of the instructor; for graduate credit: graduate standing or permission of instructor*

Selected topics from applied mathematics, algorithms, geometry, and mechanics that are fundamental to robotics and computer vision, and are also applied in computer graphics, geometric modeling and visualization, to name a few. Homogeneous coordinates and transformations, perspective projection, camera calibration, rotations and quaternions, roots of polynomials and polynomial systems, solution of linear and nonlinear equations, parametric and algebraic curves, curvature, torsion, Frenet formulas, surfaces, fundamental forms, principal curvatures, Gaussian and mean curvatures, geodesics, approximation, Fourier series and fast Fourier transform, nonlinear optimization, Lagrange multipliers, least squares, surface fitting and calculus of variations. Programming components. Scholarly report required for graduate credit.

**COM S 578: Optimization for Machine Learning**

Cr. 3.

*Prereq: Com S 472, Com S 474, or instructor permission.*

Advances in optimization theory and algorithms with evolving applications for machine learning. Theoretical foundations at the intersection of optimization and machine learning to conduct advanced research in machine learning and related fields. Emphasis on proof techniques for optimization algorithms in machine learning.

**COM S 579: Natural Language Processing**

(3-0) Cr. 3.

*Prereq: COM S 474 or COM S 574 or COM S 573*

Introduction to NLP and its connection with other branches of Artificial Intelligence, such as machine learning and knowledge representation. Text analysis including n-gram language models, stemming and lemmatization, part-of-speech (POS) tagging. Topic modeling, summarization, text classification, knowledge extraction, and text reasoning. Applications of deep learning in NLP including question answering, machine reading comprehension, word and sentence embedding. Research project required.

**COM S 581: Computer Systems Architecture**

(Cross-listed with CPR E). (3-0) Cr. 3. F.

*Prereq: CPR E 381*

Quantitative principles of computer architecture design, instruction set design, processor architecture: pipelining and superscalar design, instruction level parallelism, memory organization: cache and virtual memory systems, multiprocessor architecture, cache coherency, interconnection networks and message routing, I/O devices and peripherals.

**COM S 583: Reconfigurable Computing Systems**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: Background in computer architecture, design, and organization*

Introduction to reconfigurable computing, FPGA technology and architectures, spatial computing architectures such as systolic and bit serial adaptive network architectures, static and dynamic rearrangeable interconnection architectures, processor architectures incorporating reconfigurability.

**COM S 587: Introduction to Network Programming and Cloud Computing**

(Dual-listed with COM S 487). (3-0) Cr. 3.

*Prereq: COM S 352 or CPR E 308; for graduate credit: graduate standing or permission of instructor*

Introduction to network programming: protocols, programming suites, and applications. Introduction to cloud computing: concepts and case study with AWS. Introduction to selected research issues in networking and cloud computing. Graduate credit requires written report and oral presentation.

**COM S 588: Computer Networks**

(Dual-listed with COM S 488). (3-0) Cr. 3. F.Alt. S., offered irregularly.

*Prereq: COM S 352 or CPR E 308*

Fundamental concepts in the design and implementation of computer communication in both wired and wireless networks, their protocols, and applications. Topics include the layered network architecture in the Internet, applications, transport, network, and data link layers and their protocols, Socket API, software-defined networking, and network security. Lectures organized in a top-down approach to cover the layers of network design.

**COM S 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Special Topics in Computer Science.

**COM S 592: Graduate Studies in Computer Science**

Cr. 1.

*Prereq: Graduate classification*

Introduction to Graduate program, Graduate Program Policies, Computing Resources, Faculty Research Areas, Reading Computer Science Research Articles, LaTeX, Research Writing and Presentation, Attend Research Colloquia. Offered on a satisfactory-fail basis only.

**COM S 598: Graduate Internship**

Cr. R. Repeatable.

*Prereq: Graduate Classification*

Supervised internship working in professional settings appropriate to the student's degree program. Academic work under faculty supervision.

**COM S 599: Creative Component**

Cr. 1-3.

Creative component for nonthesis option of Master of Science degree.

Offered on a satisfactory-fail basis only.

**Courses for graduate students:****COM S 610: Seminar**

Cr. arr.

Seminar in Computer Science. Offered on a satisfactory-fail basis only.

**COM S 611: Advanced Topics in Algorithms**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 511, COM S 531*

Advanced algorithm analysis and design techniques. Topics include, but are not limited to, graph algorithms, geometric algorithms, approximation algorithms, fixed-parameter algorithms, randomized algorithms and advanced data structures. Content varies by semester.

**COM S 612: Distributed Algorithms**

(3-0) Cr. 3.

*Prereq: COM S 511 or COM S 531*

The theory of distributed computation. Algorithms, lower bounds and impossibility results. Fundamental problems including consensus, leader election, mutual exclusion and clock synchronization. Synchronous, asynchronous and partially synchronous distributed systems models. Shared memory and message passing systems. Fault-tolerance and randomization. Wait-free object simulations. Distributed shared memory. Special topics vary from year to year.

**COM S 625: Advanced Topics in High Performance Computing**

(3-0) Cr. 3.

*Prereq: COM S 511*

Advanced topics in High Performance Computing (HPC), selected topics in HPC for machine learning and machine learning for HPC. Modern HPC solutions for data science, scientific applications, numerical and non-numerical problems, implementation of parallel programs and scalable machine learning algorithms on HPC clusters and accelerators, performance and other computational issues in HPC and parallel programming.

**COM S 626: Parallel Algorithms for Scientific Applications**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 526*

Algorithm design for high-performance computing. Parallel algorithms for multidimensional tree data structures, space-filling curves, random number generation, graph partitioning and load balancing. Applications to grid and particle-based methods and computational biology.

**COM S 631: Advanced Topics in Computational Complexity**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 531*

Advanced study in the quantitative theory of computation. Time and space complexity of algorithmic problems. The structure of P, NP, PH, PSPACE, and other complexity classes, especially with respect to resource-bounded reducibilities and complete problems. Complexity relative to auxiliary information, including oracle computation and relativized classes, randomized algorithms, advice machines, Boolean circuits. Kolmogorov complexity and randomness. Novel models of computation emerging in a rapidly changing field.

**COM S 633: Advanced Topics in Computational Randomness**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 531*

Advanced study of the role of randomness in computation. Randomized algorithms, derandomization, and probabilistic complexity classes. Kolmogorov complexity, algorithmic information theory, and algorithmic randomness. Applications chosen from cryptography, interactive proof systems, computational learning, lower bound arguments, mathematical logic, and the organization of complex systems. Novel models of computation emerging in a rapidly changing field.

**COM S 634: Theory of Games, Knowledge and Uncertainty**

(3-0) Cr. 3.

*Prereq: COM S 230*

Fundamentals of Game Theory: individual decision making, strategic and extensive games, mixed strategies, backward induction, Nash and other equilibrium concepts. Discussion of Auctions and Bargaining. Repeated, Bayesian and evolutionary games. Interactive Epistemology: reasoning about knowledge in multiagent environment, properties of knowledge, agreements, and common knowledge. Reasoning about and representing uncertainty, probabilities, and beliefs. Uncertainty in multiagent environments. Aspects and applications of game theory, knowledge, and uncertainty in other areas, especially Artificial Intelligence and Economics, will be discussed.

**COM S 641: Advanced Topics in Programming Language Semantics**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 531, COM S 541*

Operational and other mathematical models of programming language semantics. Type systems and their soundness. Applications of semantics on areas such as program correctness, language design or translation.

**COM S 649: Advanced Topics in Computational Biology**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: COM S 511 and COM S 531*

Design and analysis of algorithms for applications in computational biology, pairwise and multiple sequence alignments, approximation algorithms, string algorithms including in-depth coverage of suffix trees, semi-numerical string algorithms, algorithms for selected problems in fragment assembly, phylogenetic trees and protein folding. No background in biology is assumed. Also useful as an advanced algorithms course in string processing.

**COM S 652: Advanced Topics in Distributed Operating Systems**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 552*

Concepts and techniques for network and distributed operating systems: communications protocols, processes and threads, name and object management, synchronization, consistency and replications for consistent distributed data, fault tolerance, protection and security, and distributed file systems. Research project.

**COM S 656: Advanced Topics in Verification**

(3-0) Cr. 3.

*Prereq: Graduate standing or permission of instructor*

Advanced formal methods to specify and study correctness and timing properties of complex systems and software, with a particular focus on concurrent and distributed behavior. Topics include: Petri nets and related formalisms to describe discrete-state systems; decision diagram algorithms for state-space and reachability graph generation, symbolic model checking, and timing analysis; Markov models for exact and approximate probabilistic verification.

**COM S 657: Advanced Topics in Computer Graphics**

(3-0) Cr. 3. Repeatable, maximum of 2 times.

*Prereq: COM S 228, I E 557/M E 557/CPR E 557/COM S 557*

Modern lighting models: Rendering Equation, Spherical Harmonics, Lafortune, Cook-Torrance. Non-polygonal primitives: volumes, points, particles. Textures: filtering, reflections creation. Graphics hardware: pipeline, performance issues, programmability in vertex and fragment path. Per-pixel lighting. Nonphotorealistic rendering. Radiosity; Ray tracing.

**COM S 661: Advanced Topics in Database Systems**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 461 or COM S 561*

Advanced topics chosen from the following: database design, data models, query systems, query optimization, incomplete information, logic and databases, multimedia databases; temporal, spatial and belief databases, semistructured data, concurrency control, parallel and distributed databases, information retrieval, data warehouses, wrappers, mediators, and data mining.

**COM S 665: Advanced Topics in Software Engineering**

Cr. 3. Repeatable, maximum of 6 credits. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: COM S 511*

Advanced topics on software repository analysis, data mining and software engineering, software engineering for context-aware and situation-aware computing, distributed development, product lines, safety, security, and reliability, and traceability. Content varies by semester. Maximum 6 credits of COM S 665 may apply toward graduation.

**COM S 665A: Advanced Topics in Software Engineering: Foundations**

Cr. 3. Repeatable, maximum of 6 credits. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: COM S 511*

Advanced topics on theoretical and technical foundations in Software Engineering. Content varies by semester. Maximum 6 credits of COM S 665 may apply toward graduation.

**COM S 665B: Advanced Topics in Software Engineering: Empirical**

Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: COM S 511*

Advanced topics on empirical studies on human factors and other software engineering topics. Content varies by semester. Maximum 6 credits of COM S 665 may apply toward graduation.

**COM S 672: Advanced Topics in Artificial Intelligence**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 472 or COM S 572 or COM S 573 or COM S 474 or COM S 574*

Selected topics in probabilistic graphical models, causal inference, semantic web, information retrieval, natural language processing, knowledge representation and reasoning, deep learning, embedding, distributed learning, incremental learning, multi-task learning, multi-strategy learning, multi-relational learning, modeling the internet and the web, automated scientific discovery, neural and cognitive modeling. Advanced applications of artificial intelligence in bioinformatics, distributed systems, natural language, multimedia data, decision making, robotics, and more.

**COM S 673: Advanced Topics in Machine Learning**

(3-0) Cr. 3. Repeatable.

*Prereq: COM S 472 or COM S 572 or COM S 573 or COM S 474 or COM S 574*

Advanced topics in machine learning. Selected topics in computational learning theory, Bayesian and information theoretic models (ML, MAP, MDL, MML), probabilistic graphical models, statistical relational learning, reinforcement learning, and deep learning.

**COM S 681: Advanced Topics in Computer Architecture**

(Cross-listed with CPR E). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* CPR E 581. Repeatable with Instructor permission

Current topics in computer architecture design and implementation.

Advanced pipelining, cache and memory design techniques. Interaction of algorithms with architecture models and implementations. Tradeoffs in architecture models and implementations.

**COM S 699: Research**

Cr. arr. Repeatable.

*Prereq:* Approval of instructor

Research. Offered on a satisfactory-fail basis only.

## Construction Engineering (CON E)

*Any experimental courses offered by CON E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

### **CON E 121: Cornerstone Learning Community: Orientation to Academic Life**

(0-2) Cr. 1. F.

Integration of first-year and transfer students into the engineering profession and the Construction Engineering program. Assignments and activities completed both individually and in learning teams involving teamwork, academic preparation, and study skills. Introduction to construction industry professionals. Teamwork topics include interdisciplinary teamwork, skills for academic success, diversity issues and leadership. Introduction to organization of program, department, college, and university. Overview of faculty, staff, policies, procedures and resources.

### **CON E 122: Cornerstone Learning Community: Orientation to Professional Life**

(0-2) Cr. 1. S.

Continuation of Con E 121. Integration of first-year and transfer students into the engineering profession. Career preparation, professional ethics, construction research, leadership. Introduction to construction industry professionals including how they interact with engineers in other disciplines. Continued introduction to program, department, college, and university organization. Overview of faculty, staff, policies, procedures and resources.

### **CON E 222: Contractor Organization and Management of Construction**

(2-2) Cr. 3. F.S.

*Prereq:* Credit or concurrent enrollment in (CHEM 167 or CHEM 177); C E 160; ENGL 150; ENGR 101; LIB 160; MATH 165; MATH 166; PHYS 231; PHYS 231L  
Entry level course for construction engineering: integration of significant engineering and management issues related to construction company operations. Company organization and operations; construction and project administration; construction contracts; project delivery systems; quality management; construction safety; contract and project documents.

### **CON E 241: Construction Materials and Methods**

(2-3) Cr. 3. F.S.

*Prereq:* (CHEM 167 or CHEM 177); C E 160; ENGL 150; ENGR 101; LIB 160; MATH 165; MATH 166; PHYS 231; PHYS 231L

Introduction to materials and methods of building construction and to construction drawings. Foundation, structural framing, floor, roof, and wall systems. Blueprint reading and quantity takeoff techniques.

### **CON E 251: Mechanical/Electrical Materials and Methods**

(0-3) Cr. 1. F.S.

*Prereq:* Credit or concurrent enrollment in CON E 241

Introduction to the materials and methods for mechanical and electrical construction systems and drawings. HVAC, water and waste water, power distribution, lighting, and fire protection. Blueprint reading and quantity takeoff.

### **CON E 322: Construction Equipment and Heavy Construction Methods**

(2-2) Cr. 3. F.

*Prereq:* C E 306 or (CON E 222; CON E 241)

Selection and acquisition of construction equipment. Application of engineering fundamentals and economics to performance characteristics and production of equipment. Heavy construction methods and economic applications.

### **CON E 340: Concrete and Steel Construction**

(2-2) Cr. 3. F.S.

*Prereq:* (C E 306 or CON E 222); E M 324

Planning and field engineering for concrete and steel construction. Design and applications of concrete formwork to construction. Erection of structural steel. Emerging industry themes.

### **CON E 352: Mechanical Systems in Buildings**

(2-2) Cr. 3. F.S.

*Prereq:* (CON E 222; CON E 251; PHYS 232; PHYS 232L) or Permission of Instructor

Comprehensive coverage of mechanical systems, plumbing, fire protection. Analysis techniques and design principles for each system. Required comprehensive design project for a major building project.

**CON E 353: Electrical Systems in Buildings**

(2-2) Cr. 3. F.S.

*Prereq:* ([Credit or concurrent enrollment in CON E 352]; PHYS 232; PHYS 232L) or *Permission of Instructor*

Comprehensive coverage of building electrical systems including power, lighting, fire alarm, security and communications. Analysis techniques and design principles for each system. Required comprehensive design project for a major building project.

**CON E 354: Building Energy Performance**

Cr. 3. F.

*Prereq:* CON E 352 or *Permission of Instructor*

Energy performance of buildings, building shells, HVAC, electrical and other building systems. Analysis and evaluation of building performance, energy efficiency, environmental quality, first costs, and operating costs. Strategies to exceed energy code requirements through the ASHRAE Standard 90.1.

**CON E 380: Engineering Law**

(3-0) Cr. 3. F.S.

*Prereq:* Junior classification

Introduction to law and judicial procedure as they relate to the practicing engineer. Contracts, professional liability, professional ethics, licensing, bidding procedures, intellectual property, products liability, risk analysis. Emphasis on development of critical thinking process, abstract problem analysis and evaluation.

**CON E 381: Bidding Construction Projects I**

(0-3) Cr. 1.

*Prereq:* *Permission of Instructor*

Team development of construction process designs and cost estimates for transportation construction projects under closely simulated conditions. Examine project sites, consult with construction industry mentors, obtain subcontractor and supplier quotations, and submit bids.

**CON E 381A: Bidding Construction Projects I: Heavy and Highway**

(1-0) Cr. 1. F.

*Prereq:* *Permission of Instructor*

Team development of construction process designs and cost estimates for transportation construction projects under closely simulated conditions. Examine project sites, consult with construction industry mentors, obtain subcontractor and supplier quotations, and submit bids.

**CON E 422: Construction Cost Estimating and Cost Engineering**

(2-2) Cr. 3. F.S.

*Prereq:* CON E 241; CON E 251

Conceptual and detailed cost estimating. Theory and practice of estimating construction costs of materials, labor, equipment, contingency, overhead and markup. Estimating competencies and bid ethics. Electronic quantity take off and pricing methods. Assemblies costs, unit costs, production rates. Analysis of project profitability, cost analysis and cost control methods. Value engineering. Life cycle cost analysis.

**CON E 441: Construction Planning, Scheduling, and Control**

(2-2) Cr. 3. F.S.

*Prereq:* Credit or concurrent enrollment in CON E 422

Integration of previous construction coursework into the planning, scheduling, and management of time, costs, and other resources. Emphasis on preparation and analysis of network schedules. Comprehensive planning and scheduling project. Computer project management applications.

**CON E 481: Bidding Construction Projects II**

(0-3) Cr. 1.

*Prereq:* *Permission of Instructor*

Similar to Con E 381, except students with previous experience attempt projects with larger scope or lead students with less experience.

**CON E 481A: Bidding Construction Projects II: Heavy and Highway**

(1-0) Cr. 1. F.

*Prereq:* *Permission of Instructor*

Similar to Con E 381, except students with previous experience attempt projects with larger scope or lead students with less experience.

**CON E 487: Construction Engineering Design I**

(2-2) Cr. 3. F.S.

*Prereq:* CON E 340; CON E 352; CON E 353; CON E 422; CON E 441; Senior classification

The integrated delivery of project services as a team, including preliminary engineering design process, constructability review, interaction with the client, identification of engineering problems, developments of a proposal, identification of design criteria, cost estimating, planning and scheduling, application of codes and standards, development of feasible alternatives, selection of best alternative, and delivery of oral presentations.



**CON E 488: Construction Engineering Design II**

(1-5) Cr. 3. F.S.

*Prereq:* CON E 340; CON E 352; CON E 353; CON E 422; CON E 441; *final graduating semester*

Application of team design concepts to a construction engineering project. Project planning. Advanced construction and project management.

**CON E 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* *Permission of Instructor*

Individual study in any phase of construction engineering. Pre-enrollment contract required.

## Criminal Justice (C J)

*Any experimental courses offered by C J can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**C J 120: The Criminal Justice League Learning Community Seminar**

(1-0) Cr. 1. F.

Orientation to academic program requirements, career awareness, strategies for successful transition to college. Topics include: University and LAS College requirements and procedures; occupational tracks and career options open to criminal justice; and introduction to career planning. Offered on a satisfactory-fail basis only.

**C J 121: The Criminal Justice League Learning Community Seminar II**

(1-0) Cr. 1. S.

Foundations for student success in the criminal justice major. Students will examine current issues in crime and criminal justice and build career awareness and planning skills through guest speakers and field trips. Offered on a satisfactory-fail basis only.

**C J 220: Introduction to Forensic Science**

(Cross-listed with ENT). (3-0) Cr. 3. S.

Study of fundamental forensic science techniques and procedures covering types of physical, chemical, and biological evidence and how this information is used in the legal system. Assessment of crime scenes and various forensic specialties will be introduced.

**C J 240: Introduction to the U.S. Criminal Justice System**

(3-0) Cr. 3. F.

Provides systematic overview of law, police organization and behavior, prosecution and defense, sentencing, the judiciary, community corrections, penology, and capital punishment. The course demonstrates the role of discretion in all of these agencies as well as the sociological influences of age, race, gender, and social class on criminal justice system processes.

**C J 241: Youth and Crime**

(Cross-listed with SOC). (3-0) Cr. 3. F.

An examination of delinquency that focuses on the relationship between youth as victims and as offenders, social and etiological features of delinquency, the role of the criminal justice system, delinquents' rights, and traditional and alternative ways of dealing with juvenile crime.

**C J 242: Criminology**

(3-0) Cr. 3. F.

*Prereq:* C J 240

The nature of crime and criminology; the concept of crime; statistics and theories of criminality; major forms of crime; official responses to crime and control of crime.

**C J 320: American Judicial Process**

(Cross-listed with POL S). (3-0) Cr. 3. S.

An overview of the American judicial process. Emphasis on specific topics such as application of constitutional rights to the states (particularly the Fourth, Fifth, Sixth, and Fourteenth Amendments), mechanics of judicial opinions, constitutional philosophies of Supreme Court Justices, decisions of first impression, and the value and scope of precedent.

**C J 325: Religion, Law, and Justice**

(Cross-listed with POL S, RELIG). (3-0) Cr. 3. F.

A study of the role of religion in law and justice with a focus on the United States. Examines the history of religious freedom, key contemporary legal cases, and how religious-oriented justice movements engage ethics and the law.

**C J 332: Philosophy of Law**

(Cross-listed with PHIL). (3-0) Cr. 3. F.S.

*Prereq:* 3 credits in PHIL or *Permission of Instructor*

Extent of our obligation to obey the law; what constitutes just punishment; how much of the immoral should be made illegal? Relation of these questions to major theories of law and the state. Discussion of such concepts as coercion, equality, and responsibility.

**C J 335: Race, Ethnicity, and the US Criminal Justice System**

(Cross-listed with AF AM). Cr. 3.

*Prereq: AF AM 201 or C J 240*

Empirical and theoretical readings on the intersection of race, ethnicity, crime, and the criminal justice system in contemporary society. Topics include, but are not limited to racial and ethnic relations in society, media, violence, policing, and disparity and discrimination in crime and punishment. Criminological theories of racial and ethnic antagonism.

**C J 339: Liberty and Law in America**

(Cross-listed with PHIL, POL S). (3-0) Cr. 3. F.S.

Competing conceptions of liberty in American political thought. Debates about how liberty should be protected by the law, in fields such as health care, drugs, property, speech, religion, and sex.

**C J 340: Deviant and Criminal Behavior**

(Cross-listed with SOC). (3-0) Cr. 3. S.SS.

*Prereq: C J 240 or SOC 134*

Theory and research on the etiology of types of social deviance; issues relating to crime, antisocial behavior and social policies designed to control deviant behavior.

**C J 351: Police and Society**

(3-0) Cr. 3. F.S.

*Prereq: C J 240 or C J 241 or SOC 241*

Introduction and overview of law enforcement in the United States. Theory and research on police history, function, and organization; constitutional issues of policing; and critical topics, such as community policing, officer discretion and decision-making, corruption, use of force, and racial profiling. The course illustrates the interconnections between communities, police organizations, citizens, and criminal offenders.

**C J 352: Punishment, Corrections, and Society**

(3-0) Cr. 3. F.S.

*Prereq: C J 240 or C J 241 or SOC 241*

Introduction and overview of corrections in the United States. Theory and research on probation, parole, intermediate sanctions, prison, inmate society, inmate behavior and misconduct, capital punishment, recidivism, correctional treatment, rehabilitation, and offender reintegration into society.

**C J 354: Prevention of Crime and Delinquency**

(3-0) Cr. 3. S.

*Prereq: C J 240*

Introduction to various efforts to prevent crime and juvenile delinquency, as well as the reduction of specific risk factors for both. Theories that provide the baseline for various approaches to prevention, as well as the development, operation and effectiveness of prevention efforts centered in various social institutions such as the family, schools, neighborhoods/communities, religion and the media. Examine programs originating from within the traditional criminal justice institutions of the police, courts, and correctional systems.

**C J 360: Latinas and Victimization**

(Cross-listed with US LS). (3-0) Cr. 3.

Intersections of race/ethnicity, class, gender, culture, acculturation, and immigration/migration in the victimization experiences of Latina women interacting with criminal justice systems and services. Topics include: domestic/intimate partner violence, sexual assault, human trafficking among Hispanic, Latina, and Chicana women, and the impact of language barriers, abuser threats of deportation, social and institutional discrimination and racism, cultural norms, and cultural insensitivity among first responders and service providers on help-seeking, well-being, and interactions with the criminal justice system.

**C J 402: White-Collar Crime**

(3-0) Cr. 3. S.

*Prereq: C J 240 or C J 241 or SOC 241*

Introduction and overview of white-collar crime as a form of deviance. Theory and research on occupational, corporate, and organizational offending; prevalence, costs, and consequences of white-collar crime; predictors and correlates of white-collar crime; and political, business, and public policy responses to white-collar crime.

**C J 403: Criminal Offenders**

(3-0) Cr. 3. F.S.

*Prereq: C J 240 or C J 241*

Introduction and overview of criminal offenders. Theory and research on epidemiology, offender typologies, etiology of violence, recidivism, societal costs, correctional supervision, treatment, and prevention of serious antisocial behavior.

**C J 404: Criminal Justice Policies**

Cr. 3. S.

*Prereq: C J 240*

Development, implementation and evaluation of criminal justice policies affecting major areas of the criminal justice system. History, development and operation of the criminal justice system, including policing, courts/sentencing, corrections, crime prevention, and offender rehabilitation.

### **C J 405: Drugs and Crime**

Cr. 3. Alt. F., offered irregularly.S.

*Prereq: C J 240*

Analysis of the drug problem, including issues arising from the use and abuse of legal and illegal drugs and their relation to crime and the criminal justice system. Examination of issues related to effective prevention and treatment, crime, and the debates over the most effective policies for the control or prevention of drug abuse.

### **C J 406: Gender and Crime**

Cr. 3.

*Prereq: C J 240*

Overview of the relationship between gender and crime. Examination of gender and gender roles definitions; how gender impacts criminal behavior in terms of offending, victimization, criminal justice processing, and working in the criminal justice system; and theories used to understand the gender gap in offending.

### **C J 410: Capital Punishment**

(3-0) Cr. 3.

*Prereq: C J 240*

History, philosophy, demographics, administration, and punishment rationales of capital punishment in the United States from its founding to the present. Methods of execution and trends in public opinion about the death penalty. Examination of correlates of capital offending and criminological characteristics of persons who are sentenced to death.

### **C J 451: Contemporary Issues in Policing**

(3-0) Cr. 3. F.

*Prereq: C J 351; Criminal Justice major*

Introduction to contemporary issues in policing in the United States. Topics include: the media/law enforcement relationship, cultural competence for police, use of technology, and career foundations for hiring and advancement. Scenario-based learning in individual and group settings will help students to grasp the challenges next generation leaders will face in policing.

### **C J 460: Criminal and Juvenile Justice Internship**

(Cross-listed with SOC). Cr. 3-9. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Junior or Senior classification; major or minor in Criminal Justice or Sociology*

Study of the criminal and juvenile justice systems and social control processes. Supervised placement in a police department, prosecutor's office, court, probation and parole department, penitentiary, juvenile correctional institution, community-based rehabilitation program, or related agency. Assessed service learning component. Offered on a satisfactory-fail basis only. No more than a total of 9 credits of 460 can be counted toward graduation.

### **C J 470: Ethical Issues in Criminal Justice**

(3-0) Cr. 3. S.

Ethical issues and considerations in policing, the practice of law, sentencing, corrections, criminal justice research, and crime control policy. Decision-making by criminal justice professionals in an environment of competing interest. Policy and legal issues confronting the American criminal justice system from an ethical perspective. Emphasis on moral and ethical issues in the criminal justice process.

### **C J 484: Topical Studies in Criminal and Juvenile Justice**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in C J or Permission of Instructor*

Thematic or topical issues and studies dealing with the sociology of police, judiciary, institutional and community-based corrections, gender/ethnicity and crime/delinquency, criminal and delinquent gangs, and crime and delinquency prevention.

**Courses primarily for graduate students, open to qualified undergraduates:**

### **C J 584: Current Issues in Crime and Justice**

(Cross-listed with SOC). (3-0) Cr. 3. Repeatable, maximum of 3 credits. Alt. F., offered odd-numbered years.

*Prereq: 6 credits in sociology*

Discussion of current research and theory in crime and delinquency; topics include the purpose and role of law in social life; emerging theoretical directions in criminology; recent work on specific forms of criminality; controversies in the criminal justice system.

## **Cyber Security (CYBSC)**

**Courses primarily for undergraduates:**

### **CYBSC 131: Introduction to Computer Security Literacy**

(Cross-listed with CPR E). (1-0) Cr. 1.

Basic concepts of practical computer and Internet security: passwords, firewalls, antivirus software, malware, social networking, surfing the Internet, phishing, and wireless networks. This class is intended for students with little or no background in information technology or security. Basic knowledge of word processing required. Offered on a satisfactory-fail basis only.

### **CYBSC 332: Cyber Defense Competition**

(Cross-listed with CPR E). (0-2) Cr. 1. Repeatable. S.

Participation in cyber defense competition driven by scenario-based network design. Includes computer system setup, risk assessment and implementation of security systems, as well as defense of computer and network systems against trained attackers. Team based. Offered on a satisfactory-fail basis only.

**CYBSC 430: Network Protocols and Security**

(Dual-listed with CYBSC 530). (Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 308 OR COM S 252 OR COM S 352. E E students: CPR E 288.*

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

**Courses primarily for graduate students, open to qualified undergraduates:**

**CYBSC 530: Network Protocols and Security**

(Dual-listed with CYBSC 430). (Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 308 OR COM S 252 OR COM S 352. E E students: CPR E 288.*

Detailed examination of networking standards, protocols, and their implementation. TCP/IP protocol suite, network application protocols. Network security issues, attack and mitigation techniques. Emphasis on laboratory experiments.

**CYBSC 531: Information System Security**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530 or COM S 586 or MIS 535*

Computer, software, and data security: basic cryptography, security policies, multilevel security models, attack and protection mechanisms, legal and ethical issues.

**CYBSC 532: Information Warfare**

(Cross-listed with CPR E). (3-0) Cr. 3. S.

*Prereq: CPR E 430 or 530*

Computer system and network security: implementation, configuration, testing of security software and hardware, network monitoring. Authentication, firewalls, vulnerabilities, exploits, countermeasures. Study and use of attack tools. Ethics in cyber security. Emphasis on laboratory experiments.

**CYBSC 533: Cryptography**

(Cross-listed with CPR E, MATH). (3-0) Cr. 3. S.

*Prereq: MATH 301 or CPR E 310 or COM S 230*

Basic concepts of secure communication, DES and AES, public-key cryptosystems, elliptic curves, hash algorithms, digital signatures, applications. Relevant material on number theory and finite fields.

**CYBSC 534: Legal and Ethical Issues in Cyber Security**

(Cross-listed with CPR E, POL S). (3-0) Cr. 3. S.

*Prereq: Graduate classification; CPR E 531 or CYBSC 531*

Legal and ethical issues in computer security. State and local codes and regulations. Privacy issues.

**CYBSC 535: Steganography and Digital Image Forensics**

(Cross-listed with CPR E, MATH). (3-0) Cr. 3. S.

*Prereq: E E 524 or MATH 317 or MATH 407 or COM S 230*

Basic principles of covert communication, steganalysis, and forensic analysis for digital images. Steganographic security and capacity, matrix embedding, blind attacks, image forensic detection and device identification techniques. Related material on coding theory, statistics, image processing, pattern recognition.

**CYBSC 536: Computer and Network Forensics**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CPR E 489 or CPR E 530*

Fundamentals of computer and network forensics, forensic duplication and analysis, network surveillance, intrusion detection and response, incident response, anonymity and pseudonymity, privacy-protection techniques, cyber law, computer security policies and guidelines, court testimony and report writing, and case studies. Emphasis on hands-on experiments.

**CYBSC 538: Reverse Engineering and Security Testing**

(Cross-listed with CPR E). (2-3) Cr. 3. S.

*Prereq: COM S 321 or CPR E 381, COM S 352 or CPR E 308*

Techniques and tools for understanding the behavior of software/hardware systems based on reverse engineering. Flaw hypothesis, black, grey, and white box testing as well as other methods for testing the security of software systems. Discussion of counter-reverse engineering techniques.

**CYBSC 560: Data-Driven Security and Privacy**

(Cross-listed with COM S, CPR E). Cr. 3. Alt. S., offered irregularly.

*Prereq: CPR E 531; COM S 474 or COM S 573*

Examination of applications of machine learning and big data techniques to various security and privacy problems, as well as secure and privacy-preserving machine learning algorithms.

**CYBSC 592: Seminar in Cyber Security**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Projects or seminar in Cyber Security.

**Courses for graduate students:**

**CYBSC 631: Cyber Security Operations Practicum**

(Cross-listed with CPR E). Cr. 3. Repeatable.

*Prereq: CPR E 532; CPR E 534; and permission of instructor*

Practical experience in cyber operations. Cyber security threat analysis, malware analysis, and intrusion detection management. Cyber security data analysis methods. Pen testing tools and techniques. Weekly threat analysis briefings. Offered on a satisfactory-fail basis only.

**CYBSC 632: Cyber Security Capstone Design**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: CYBSC 531, CYBSC 532, CYBSC 534*

Capstone design course which integrates the security design process. Design of a security policy. Creation of a security plan. Implementation of the security plan. The students will attack each other's secure environments in an effort to defeat the security systems. Students evaluate the security plans and the performance of the plans. Social, political and ethics issues. Student self-evaluation, journaling, final written report.

**CYBSC 634: Current Research Problems in Cyber Security**

(3-0) Cr. 3. Repeatable. F.S.

*Prereq: CPR E 530, CPR E 531, permission of instructor.*

Discussion of complex cyber security problems. Students will learn how to apply research techniques, think clearly about these issues, formulate and analyze potential solutions, and communicate their results. Working in small groups under the mentorship of technical clients from government and industry, each student will formulate, carry out, and present original research on complex current cybersecurity problems of interest to the nation. This course will be run in a synchronized distance fashion, coordinating some activities with our partner schools and our technical clients.

**CYBSC 697: Cyber Security Summer Internship**

Cr. R.

*Prereq: Permission of department, graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

## Cyber Security Engineering (CYB E)

**Courses primarily for undergraduates:****CYB E 230: Cyber Security Fundamentals**

(Cross-listed with CPR E). (2-2) Cr. 3. F.

*Prereq: COM S 227 or E E 285 or MIS 207.*

Introduction to computer and network infrastructures used to support cyber security. Basic concepts of computer and network configuration used to secure environments. Computer virtualization, network routing and address translation, computer installation and configuration, network monitoring, in a virtual environment. Laboratory experiments and exercises including secure computer and network configuration and management.

**CYB E 231: Cyber Security Concepts and Tools**

(Cross-listed with CPR E). (2-2) Cr. 3. S.

*Prereq: CPR E 230 or CYB E 230*

Basic concepts of practical computer and Internet security and the tools used to protect and attack systems and networks. Computer and network security methods including: user authentication, access control, firewalls, intrusion detection, use of vulnerability assessment tools and methods, and penetration testing. Ethics and legal issues in cyber security will also be covered. Laboratory experiments and exercises including evaluating systems for vulnerabilities, understanding potential exploits of the systems, and defenses for the systems.

**CYB E 234: Legal, Professional, and Ethical Issues in Cyber Systems**

(Cross-listed with CPR E). (3-0) Cr. 3. S.

*Prereq: COM S 227, or E E 285, or MIS 207*

Emphasizes legal, ethical, and professional issues in cyber systems. Other topics include privacy, government regulation, and compliance as applied to professional practice. Guest lecturer from government and industry, as well as discussions including current legal and ethical issues found in the main stream.

**CYB E 331: Application of Cryptographic Concepts to Cyber Security**

(Cross-listed with CPR E). Cr. 3. F.S.

*Prereq: CPR E 231 or CYB E 231*

Basic cryptographic underpinnings used in modern cyber security encryption suites. Encryption benefits to cyber security and its use in protocols. Topics include cryptographically secure hash functions and pseudorandom numbers, key distribution techniques, secure authentication including single sign on. Detection and prevention of security threats such as covert communication, malicious code, and other security threats in protocols are included. In addition to laboratory experiments and exercises, students complete a project focused on cyber security problem and solution. Only one of CPR E/CYB E 331 and CPR E 431 may count towards graduation.

**CYB E 440: Operating System Security**

(Cross-listed with CPR E). (3-0) Cr. 3. S.

*Prereq: CPR E 308 OR COM S 352.*

Focus on fundamentals and advanced topics in operating system (OS) security. Design issues, principles, mechanisms, and good practice for design and implementation of secure computer/OS systems. Threat models, vulnerabilities, attacks compromise security, and advanced OS-level techniques for achieving security. Topics include OS security concepts and principles, seminal security in Multics, vulnerabilities in ordinary systems, secure capability systems, information flow control, mandatory access control, security kernels, memory protection, file system, virtual machine systems, hardware/architecture support (e.g., Intel SGX) for OS security, secure microkernel OSes (e.g., seL4, QNX), modern mobile operating systems (e.g., Android and iOS), and security from end-user perspective. Assignments include labs exploring and implementing the technologies in the context of the Linux, Android, and seL4 systems (some involving kernel programming).

## Dance (DANCE)

***Any experimental courses offered by DANCE can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**DANCE 120: Modern Dance I**

(0-3) Cr. 1. F.S.

Introduction and practice of basic dance concepts, including preparatory techniques and guided creativity problems. No previous modern dance experience required. Offered on a satisfactory-fail basis only.

**DANCE 130: Ballet I**

(0-3) Cr. 1. F.S.

Introduction to the basic skills, vocabulary, and tradition of ballet with concentration on control and proper alignment. No previous ballet experience required. Offered on a satisfactory-fail basis only.

**DANCE 140: Jazz I**

(0-3) Cr. 1. F.S.

Introduction to the modern jazz style with concentration on isolation and syncopation. No previous jazz experience required. Offered on a satisfactory-fail basis only.

**DANCE 150: Tap Dance I**

(0-3) Cr. 1. F.

Instruction and practice in basic tap technique and terminology. No previous tap experience required. Offered on a satisfactory-fail basis only.

**DANCE 160: Ballroom Dance I**

(0-2) Cr. 1. F.S.

Instruction and practice in foxtrot, waltz, swing, cha cha, rhumba, tango, and selected contemporary dances. Offered on a satisfactory-fail basis only.

**DANCE 199: Dance Continuum**

Cr. 0.5-2. Repeatable, maximum of 6 credits. S.

*Prereq: Permission of Instructor*

Advance registration required. Continued instruction and practice in either modern dance, recreational dance, ballet, jazz and/or compositional skills. Offered on a satisfactory-fail basis only.

**DANCE 211: Fundamentals and Methods of Social and World Dance**

(1-3) Cr. 1. S.

*Prereq: Physical Education Teacher Education Specialization*

Skill enhancement, teaching, progressions with emphasis on world and social dance. Designed for kinesiology and health majors, open to others.

**DANCE 220: Modern Dance Composition**

(1-3) Cr. 2. F.

*Prereq: DANCE 120 or Permission of Instructor*

Theory and practice of the creative skills involved in solo and small group composition.

**DANCE 222: Modern Dance II**

(0-3) Cr. 1. F.

*Prereq: DANCE 120 or Permission of Instructor*

Dance techniques emphasizing strength, balance, endurance, rhythmic activity and extended combinations.

**DANCE 223: Modern Dance III**

(0-3) Cr. 1. S.

*Prereq: DANCE 222*

Continued experience in dance techniques and extended combinations. Emphasis on maturation of skill and artistry. Exposure to a variety of modern dance technical styles.

**DANCE 224: Concert and Theatre Dance**

(Cross-listed with THTRE). (0-3) Cr. 0.5-2. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Choreography, rehearsal, and performance in campus dance concerts and/or musical theatre productions. Offered on a satisfactory-fail basis only.

**DANCE 232: Ballet II**

(0-3) Cr. 1. S.

*Prereq: Permission of Instructor*

Technical skills in the classical movement vocabulary. Emphasis on alignment, techniques, sequence development, and performing quality.



**DANCE 233: Ballet III**

(0-3) Cr. 1. F.

*Prereq: DANCE 232*

Concentration on technical proficiency at the intermediate level. Pointe work and partnering opportunities available.

**DANCE 242: Jazz II**

(0-3) Cr. 1. S.

*Prereq: Permission of Instructor*

Dance concepts within the jazz idiom. Instruction in extended movement sequences and artistic interpretation.

**DANCE 250: Yoga Movement**

(0-2) Cr. 1. Repeatable. F.S.

Mixed-level Hatha Yoga class that emphasizes Iyengar style yoga. Yoga Movement is designed for developing awareness and personal practice with yoga poses and relaxation techniques. Attention will be paid to postural alignment to safely develop strength, endurance, flexibility, balance, and reduce stress. The practice develops awareness and consciousness in the physical body to help unite body and mind. Class will include introduction to other somatic practices, asanas (poses), breathing practices, meditation, yoga philosophy and deep relaxation.

**DANCE 270: Dance Appreciation**

(3-0) Cr. 3. F.S.

Introduction to the many forms and functions of dance in world cultures. Develop abilities to distinguish and analyze various dance styles. No dance experience required. Meets International Perspectives Requirement.

**DANCE 320: Sound and Movement**

(2-2) Cr. 3. S.

*Prereq: DANCE 220*

Intermediate composition based on the relationship of movement to improvised sounds, rhythmic scores, and the musical works of composers from various periods.

**DANCE 360: History and Philosophy of Dance**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: DANCE 270*

Study of the history of dance from early to modern times with emphasis on the theories and philosophies of contemporary modern dance, dancers, and dance educators.

**DANCE 370: Advanced Studies in Dance**

Cr. 1-3. Repeatable, maximum of 8 credits. F.S.

*Prereq: 2 credits in DANCE*

Advance registration required. Designed to meet special interests and talents of students to include both group and independent study in various aspects of dance as a performing art including production, choreography, and performance.

**DANCE 384: Teaching Children's Dance**

(1-3) Cr. 2. S.

Content, experiences, and methods of a comprehensive dance program at the elementary school level. Theories and practice in guiding elementary school children in expressive movement experiences.

**DANCE 385: Methods of Teaching Dance**

(1-3) Cr. 2. F.

Methods and techniques of teaching social and world dance forms. Introduction to teaching educational modern dance.

**DANCE 386: Teaching Dance Technique and Composition**

(1-3) Cr. 2.

*Prereq: DANCE 320*

Teaching yoga, body therapies, mindfulness and dance composition to enhance the physical and mental performance of the individual.

**DANCE 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

Independent study of problems or areas of interest in dance.

**DANCE 490A: Independent Study: Dance**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Independent study of problems or areas of interest in dance.

**DANCE 490H: Independent Study in Dance - Honors**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Independent study of problems or areas of interest in dance for those admitted to the honors program.

## Data Science (DS)

***Any experimental courses offered by DS can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**DS 110: Orientation to Data Science**

Cr. R. F.

Introduction to the procedures and policies of Iowa State University and the Data Science program, test-outs, honorary societies, etc. Issues relevant to student adjustment to college life will also be discussed. Offered on a satisfactory-fail basis only.

**DS 201: Introduction to Data Science**

Cr. 3. F.S.Alt. SS., offered irregularly.

*Prereq: Placement into MATH 143*

Data Science concepts and their applications; domain case studies with applications in various fields; overview of data analysis; major components of data analysis pipelines; computing concepts for data science; descriptive data analysis; hands-on data analysis experience; communicating findings to stakeholders, and ethical issues in data science. Placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**DS 202: Data Acquisition and Exploratory Data Analysis**

Cr. 3. F.S.

*Prereq: DS 201*

Data acquisition: file structures, web-scraping, database access; ethical aspects of data acquisition; types of data displays; numerical and visual summaries of data; pipelines for data analysis: filtering, transformation, aggregation, visualization and (simple) modeling; good practices of displaying data; data exploration cycle; graphics as tools of data exploration; strategies and techniques for data visualizations; basics of reproducibility and repeatability; web-based interactive applets for visual presentation of data and results. Programming exercises.

**DS 301: Applied Data Modeling and Predictive Analysis**

Cr. 3. F.S.

*Prereq: DS 202; 1 course from the following: STAT 101, STAT 104, STAT 105, STAT 201, STAT 226, STAT 231, STAT 305, STAT 322, STAT 330*

Elements of predictive analysis such as training and test sets; feature extraction; survey of algorithmic machine learning techniques, e.g. decision trees, Naïve Bayes, and random forests; survey of data modeling techniques, e.g. linear model and regression analysis; assessment and diagnostics: overfitting, error rates, residual analysis, model assumptions checking; communicating findings to stakeholders in written, oral, verbal and electronic form, and ethical issues in data science. Participation in a multi-disciplinary team project.

**DS 303: Concepts and Applications of Machine Learning**

Cr. 3. F.

*Prereq: DS 202; MATH 207; MATH 265; STAT 301*

Machine learning concepts such as training and test sets; feature extraction; principles of machine learning techniques; regression; pattern recognition methods; unsupervised learning techniques; assessment and diagnostics: overfitting, error rates, residual analysis, model assumptions checking, feature selection; ethical issues in data science; communicating findings to stakeholders in written, oral, visual and electronic form.

**DS 401: Data Science Capstone**

Cr. 3. Alt. F., offered irregularly.Alt. S., offered irregularly.

*Prereq: DS 301 or DS 303*

Students work as individuals and teams to complete the planning, design, and implementation of a significant multi-disciplinary project in data science. Oral and written reports.

## Design (DES)

***Any experimental courses offered by DES can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:****DES 150: Introduction to Innovation and Design**

(3-0) Cr. 3.

Introduction to the concept of human-centered design and its crucial role for innovation, including fundamental concepts that explain the creative process. Builds an understanding of the innovation journey, through design tools and techniques for ideation, data collection, and insights forecasting.

**DES 230: Design Thinking**

(3-0) Cr. 3.

Introduction to design thinking processes, toolkits, and mindsets, and its interaction with art, design, and technology. Emphasis on interdisciplinary practices.

**DES 240: Design Innovation Studio**

(0-6) Cr. 3.

First project-based studio focused on creative problem solving, idea generation, and design principles. Analogue and digital fabrication of mock-ups and sketch models. All majors are encouraged to enroll; no previous design studio training required.

**DES 250: Design Intersections**

(3-0) Cr. 3.

Cross disciplinary themes and issues relevant to interdisciplinary design, innovation, and entrepreneurship, such as design activism and agency, design for social change, civic innovation, and creative leadership.

**DES 330: Visual Literacy for Design Critique**

(3-0) Cr. 3. S.

Interpret, analyze, and evaluate visual materials, use images and text effectively to communicate ideas, and understand issues surrounding the creation and use of images and visual media for design critique. Precedent study and critique of sample student design work to understand principles of visual literacy and how to apply them to the presentation of design work. Emphasis on peer-to-peer discussion and in-class participation. Lecture and discussion format.

**DES 340: Design Entrepreneurship Studio**

(0-6) Cr. 3.

*Prereq: DES 240 or 3 credits of 200-level or above studio in a College of Design major, or*

Second project-based studio focused on addressing complex challenges and contemporary societal problems using key entrepreneurship concepts to evaluate design prototypes and minimum viable products. Application of user insights and customer data in design iteration. Expert guest speakers from business and industry to talk about design innovation. Students in all majors encouraged to enroll.

**DES 491: Portfolio and Professional Preparation**

(1-4) Cr. 3.

Discussion of interdisciplinary design practices and career planning. Guidance for interviewing, professional networking, business etiquette, and resume writing. Workshops and lectures.

**DES 495: Design Innovation Launchpad**

(0-12) Cr. 6.

*Prereq: DES 340 or 3 credits of 300-level or above studio in a College of Design major, or permission of instructor*

Third project-based studio as applied design lab for a career, enterprise, business, social movement, or campaign. Launching and creating project start-ups in four areas: design research, design management, design leadership, and design entrepreneurship. Advanced practice of design skills, project planning, and new product development.

## Design Studies (DSN S)

**Any experimental courses offered by DSN S can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**DSN S 102: Design Studio I**

(1-6) Cr. 4.

A foundation design studio exploring two and three-dimensional design. Emphasis on fundamental skills and ideas shared across design disciplines. Creative processes, visual order, materials, and critical thinking are investigated through studio projects. Lectures and discussions cover the topics introduced in studios.

**DSN S 110: Design Exchange Seminar I**

(0-2) Cr. 1. F.

*Prereq: Member of Design Exchange Learning Community*

Orientation to the College of Design. Introduction to the design disciplines and studio pedagogy.

**DSN S 111: Design Exchange Seminar II**

(0-2) Cr. 1. S.

*Prereq: Member of the Design Exchange Learning Community, DSN S 110*

Development and clarification of career and academic plans.

**DSN S 115: Design Collaborative Seminar**

(1-0) Cr. 1.

*Prereq: Member of Design Collaborative Learning Community*

Orientation to the College of Design. Introduction to the design disciplines and studio pedagogy.

**DSN S 131: Drawing I**

(1-6) Cr. 4.

An introduction to methods of visual thinking and drawing through studio experiences and lectures. All design fields utilize visual communication and drawing. Focus on the use of drawing as a method for creative problem solving, design development and visual communication. Explore, from observation and imagination, the use of fast sketching and in-depth drawing, using various scales, mediums and processes.

**DSN S 132: Digital Design Literacy**

Cr. 1. F.S.

*Prereq: Admittance to Core Design Program*

Introduction to cross-disciplinary concepts on digital literacy. Covers basic computer fundamentals, addresses file and image handling, illustrates the basic principles of documentation, demonstrates how to effectively present your work, and introduces the basic software necessary for design disciplines.

**DSN S 145: Diversity in Art**

Cr. 1. Repeatable, maximum of 3 credits. S.

Discussion on issues of diversity and inclusion utilizing the Art on Campus and University's Permanent Collection. Topics include ethnic heritage, family background, religious traditions, and interpersonal relationships, with a significant focus on instilling visual analysis skills.

**DSN S 183: Design in Context**

(3-0) Cr. 3.

Explores designed media, objects, places, spaces, structures, and systems as products of varied and often intersecting contexts. Using historical and contemporary case studies, investigates how cultural, economic, environmental, spatial, social, and temporal contexts, among others, affect design. Explores in particular how design addresses complex and multifaceted problems.

**DSN S 232: Digital Design Communications**

(3-0) Cr. 3.

Introductory investigations of various digital design media to develop multi-dimensional problem solving, digital communication skills and perceptual sensitivity. Open to all university majors.

**DSN S 301: Study Abroad Preparation Seminar**

(1-0) Cr. 1. Repeatable.

Cultural introduction to host country, introduction to faculty sponsor and program of study, the particulars of traveling and living abroad, and financial and logistical preparations. Guest lectures. Required of all students planning to participate in a College of Design study abroad program for 9 or more credits. Offered on a satisfactory-fail basis only.

**DSN S 302: Design Leadership Seminar**

(1-2) Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Permission of Instructor*

For students serving as peer mentors for the Core Design Program, under faculty supervision. Development of teaching and leadership skills within the context of design education experiences. Offered on a satisfactory-fail basis only.

**DSN S 303: Design Ambassadors**

(1-2) Cr. 1-2. Repeatable, maximum of 4 credits.

*Prereq: Permission of Instructor*

Opportunity to strengthen leadership, communication and presentation skills. Introduction to student development theory. Students participate in collaborative projects focused on prospective design students. Offered on a satisfactory-fail basis only.

**DSN S 304: Global Challenges: Intro to UN Sustainable Development Goals**

(3-0) Cr. 3.

The United Nations Sustainable Development Goals — also known as the SDGs or the Global Goals — cover a wide range of sustainability issues; highlighting local, national and international priority areas to end poverty and hunger, improve health and education, make cities more sustainable and combat climate change. Students are empowered & challenged to become self-directed as they explore each issue individually and collectively from a personal, academic, and professional perspective. Meets International Perspectives Requirement.

**DSN S 310: Practical Experience**

Cr. R.

*Prereq: Permission of Instructor*

Independent educational enrichment through practical experience. Students must register for this course prior to commencing each term. Available only to students taking course loads of eleven credits or less. Offered on a satisfactory-fail basis only.

**DSN S 332: Multi-Dimensional Digital Design Communication**

(3-0) Cr. 3.

*Prereq: ARCH 230, ARTGR 275, ARTIS 212, DSN S 232, or IND D 240.*

Investigations of interoperable digital-design tools, techniques and methods directed at human scale interactive hybrid design from ideation to visualization, synthesis to analysis, and realization to fabrication.

**DSN S 333: Time-Based Digital Media**

(3-0) Cr. 3. S.

*Prereq: ARCH 230, ARTGR 275, ARTIS 212, DSN S 232, or IND D 240.*

Introduction to various time-based digital media tools to develop basic skills including sequencing, storytelling, animation, sound editing, and video production.

**DSN S 340: Design Entrepreneurship**

(3-0) Cr. 3.

Focus on the interconnection between entrepreneurial thinking and applied design practices of innovation. Explores several business management tools, models and frameworks, relating it to the development of design projects. Critical areas for successful growth, open innovation, and entrepreneurial mindset. Designer entrepreneurs are more attuned to the social and meaningful values of their creations, than economic growth for an industrial venture. Social impact, inclusive responsibility, future foresight and change mindset are the key motors of their dive into innovation and creative problem-solving. By developing an attitude towards risk-taking, initiative, uncertainty and creative leaps, the course is substantiated by strategy planning and leadership skill sets that allow students to turn their innovative ideas and conceptual solutions into products (or services or experiences), and to distribute them in a viable market and/or a business venture.

**DSN S 445: Public Art/Public Space**

(3-0) Cr. 3.

*Prereq: Junior classification*

Exploration of the history, precedents, and practice of public art and public space with a focus on developments since 1970 in the United States and abroad. Course includes development of a proposal for a site specific work of art.

**DSN S 446: Interdisciplinary Design Studio**

(0-12) Cr. 4-6. Repeatable, maximum of 18 credits.

*Prereq: Permission of instructor*

Advanced interdisciplinary design projects.

**DSN S 446H: Interdisciplinary Design Studio: Honors**

(0-12) Cr. 5-7. Repeatable, maximum of 18 credits.

*Prereq: Permission of instructor.*

Advanced interdisciplinary design projects.

**DSN S 478D: Landscape Architecture: History/Theory/Criticism**

(Cross-listed with L A). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 478E: Landscape Architecture: Landscape Planning**

(Cross-listed with L A). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 478G: Landscape Architecture: Graphics**

(Cross-listed with L A). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 478I: Landscape Architecture: Interdisciplinary Studies**

(Cross-listed with L A). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 478J: Landscape Architecture: International Studies**

(Cross-listed with L A). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 478K: Computer Applications**

(Dual-listed with DSN S 578). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 371 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490A: Independent Study: History**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490B: Independent Study: Technology**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490C: Independent Study: Communications**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490D: Independent Study: Design**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490E: Independent Study: Entrepreneurship**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490F: Independent Study: Social/Behavioral**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490G: Independent Study: Outreach**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment.*

Independent investigation of a topic of special interest to the student.

**DSN S 490H: Independent Study: Honors**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

**DSN S 490I: Independent Study: Sustainability**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment.*

Independent investigation of a topic of special interest to the student.

Offered on a satisfactory-fail basis only.

**DSN S 492: Introduction to Italian Culture**

(1-0) Cr. 1. Repeatable, maximum of 3 credits.

*Prereq: Enrollment in the College of Design Rome Study Abroad Program*

Introduction to Italian contemporary culture for design students, including food, religion, fashion, politics, media, and social mores.

**Courses primarily for graduate students, open to qualified undergraduates:**

**DSN S 501: Introduction to Research Design**

(3-0) Cr. 3. F.

*Prereq: Admission into a graduate program or senior standing.*

Introduction to research design and methodology in social science research. Essential knowledge and skills required to frame and conduct research independently. Emphasizes various aspects of research design including: foundations of research; understanding research -related concepts; research ethics; developing research questions; reviewing literature and theory; critiquing and evaluating research studies; exploring data collection and analysis; writing research proposal and presenting findings to a diverse audience.

**DSN S 546: Interdisciplinary Design Studio**

(0-12) Cr. 4-6. Repeatable, maximum of 18 credits.

*Prereq: Graduate or senior standing in the College of Design and permission of instructor*

Advanced interdisciplinary design projects.

**DSN S 578: Topical Studies in Landscape Architecture**

(Dual-listed with DSN S 478). (3-0) Cr. 2-3. Repeatable. F.S.SS.

*Prereq: Senior Classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 578C: Construction**

(Dual-listed with DSN S 478). (3-0) Cr. 2-3. Repeatable. F.S.SS.

*Prereq: Senior Classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 578H: Landscape Architecture: Honors**

Cr. 2-3. Repeatable. F.S.SS.

*Prereq: Senior classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**DSN S 585: Renaissance Art**

(3-0) Cr. 3.

*Prereq: Graduate classification and permission of instructor*

European art including painting, sculpture, architecture, and crafts; thirteenth through sixteenth centuries.

**DSN S 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form prior to semester of enrollment*

Independent investigation of a topic of special interest to the student.

## Dietetics (DIET)

***Any experimental courses offered by DIET can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**DIET 511: Research Methods**

(3-0) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

An overview of diverse research approaches focusing on methods for collecting and analyzing quantitative and qualitative data. Only one of DIET 511 or FCEDS 511 may count toward graduation.



**DIET 512: Nutritional Epidemiology**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Important issues related to designing, conducting, and interpreting research on the role of diet or physical activity in the development of disease (& health) in human populations.

**DIET 526: Obesity Across the Lifespan**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Exploration of the affects that obesity has on public health, the healthcare system, and society in general. Overview of strategies to prevent obesity across the lifespan.

**DIET 530: Nutrition and Wellness**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Addresses wellness promotion through nutrition. Nutritional risk and protective factors will be examined in relation to public health and individual nutrition.

**DIET 531: Nutrition Therapy for Eating Disorders**

(3-0) Cr. 3. Repeatable. F.

*Prereq: Enrollment in MFCS-Dietetics and a course in medical nutrition therapy or consent of instructor.*

An online study of eating disorders management and nutrition care. Topics include eating disorders medical complications, clinical care guidelines, basic pharmacology, clinical nutrition education, nutrition care planning, psychology of eating disorders, team collaboration, and therapeutic modalities for nutrition counseling.

**DIET 532: Maternal and Child Nutrition**

(3-0) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Critical examination of behavioral, physiological, and public health issues impacting dietary and nutritional factors that support normal growth and development. Content focuses on early stages of the life cycle: gestation, lactation, infancy, preschool, school age, and adolescence.

**DIET 534: Nutrition Education in the Community**

Cr. 3. S.

*Prereq: Enrollment in GPIDEA MFCS in Dietetics*

Principles and practices of teaching individuals and groups to translate nutrition knowledge into action. Emphasis on research in and evaluation of nutrition education.

**DIET 538: Nutrition: A Focus on Life Stages**

(3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Explores influence of normal physiological stresses on nutritional needs throughout the life span. Evaluates dietary intake and identification of appropriate community nutrition services in on-line discussions. Specific considerations, such as the influence of age and cultural heritage, are incorporated.

**DIET 540: Nutrition and Physical Activity in Aging**

(Cross-listed with GERON). (3-0) Cr. 3. F.

WWW only. Basic physiologic changes during aging and their impacts in health and disease. The focus will be on successful aging with special emphasis on physical activity and nutrition. Practical application to community settings is addressed.

**DIET 541: Food Culture**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Survey of topics that affect how we perceive food in the modern world. Food is examined as a badge of cultural identity, focus of media scrutiny and promotion, symbol of religion, and driver of technology.

**DIET 546: Phytochemicals**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Overview of phytochemicals (non-nutritive biologically active compounds) from fruits, vegetables, cereals and oilseeds. Covers recent findings of chemistry, physiological functions, and potential health implications of phytochemicals.

**DIET 547: Functional Foods in Chronic Disease Prevention**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examination of nutritional science, food science, regulatory principles, and nutrient metabolism to understand and explain functional foods, nutraceuticals, and dietary supplements. Additionally students will evaluate the biochemical basis, technologies, legal requirements, and clinical assessment in the marketplace.

**DIET 548: Nutrition and Physical Activity Assessment**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Introduction to a variety of nutrition and physical activity assessment tools. Opportunity to discuss the strengths and weaknesses of different tools and gain experience collecting, analyzing, and interpreting nutrition and physical activity data.

**DIET 551: Advanced Nutrition: Nutrigenomics, Nutrigenetics & Advanced Lipid Metabolism in Human Nutrition**

Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Exploration and integration of topics and ideas that are at the forefront of the field of nutritional science. Examination of topics that are new and/or controversial and have implications that range from the cellular/molecular/biochemical level up to clinical/educational level. Emphasis on the integrative and complex nature of human nutrition research from basic science to clinical studies to population studies and dietary recommendations.

**DIET 554: Statistics**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Tools used to make statistical decisions. Major emphasis on explanation and understanding of important concepts involved; basic theme is understanding of data and methods used to analyze such data. Only one of DIET 554 or Stat 401, 495, 542 may count toward graduation by students in the GPIDEA Dietetics program.

**DIET 555: Public Health Nutrition**

Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examines U.S. public health and nutrition concerns in diverse U.S. populations, examines nutritional status in communities, looks at health communication, and considers nutrition policies and community-based nutrition interventions. Students explore roles of dietitians, nutritionists, and others in developing and delivering nutrition policies and interventions in U.S. communities.

**DIET 556: Micronutrients in Human Nutrition**

(3-0) Cr. 3. S.SS.

*Prereq: BBMB 404 or BBMB 420 or equivalent; enrollment in GP-IDEA MFCS in Dietetics*

Interrelationships of micronutrients in terms of biochemistry, physiology, genetics, and nutrition. Emphasis on developing understanding of how the coordination of structure and function is related to metabolic needs of the cell and its response to the environment. This integrated approach forms the basis for evaluating the micronutrient needs of humans in both normal and altered metabolic states. Only one of DIET 556 or NUTRS 502 may count toward graduation.

**DIET 558: Advanced Human Nutrition: Macronutrients**

(3-0) Cr. 3. SS.

*Prereq: BBMB 404 or BBMB 420 or equivalent; enrollment in GP-IDEA MFCS in Dietetics*

Integration of the molecular, cellular and physiological aspects of macronutrients and energy metabolism in mammalian systems. Dietary energy, carbohydrates, fiber, lipids, proteins, their interactions, metabolic consequences, and major research methodologies. Only one of DIET 558 or NUTRS 501 may count toward graduation.

**DIET 560: Advanced Medical Nutrition Therapy**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention directed to medical nutrition needs of patients in the treatment of each disease state. Only two of DIET 560 or NUTRS 561, 564 may count toward graduation.

**DIET 565: International Nutrition and World Hunger**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Identification and assessment of malnutrition in low-income countries. Social, cultural, political, economic, and geographic determinants of malnutrition. Protein-energy malnutrition, vitamin and mineral deficiencies. Intervention approaches; international efforts and local sustainability.

**DIET 566: Nutrition Counseling and Education Methods**

(2-2) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**DIET 568: Entrepreneurship Theory and Practice**

(3-0) Cr. 3. Alt. SS., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Definition and discussion of entrepreneurship and its importance to economic and business environment.

### **DIET 569: Dietary and Herbal Supplements**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Develop skills to partner with patients in making dietary supplement decisions. Explore the safe, efficacious use of botanicals and supplements in nutritional support of aging, maternal health and wellness. Discussions on supplementation in the prevention and treatment of chronic disease include: arthritis, cancer, cardiovascular, diabetes, digestive, liver and renal disorders.

### **DIET 570: Nutrition and Human Performance**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Develop an understanding of nutrition based on knowledge of the biochemical and physiological process and functions of specific nutrients in meeting nutritional requirements. Emphasis on the relationship of optimal nutrition and physical efficiency and performance.

### **DIET 571: Foundation of Leadership in Dietetics**

(3-0) Cr. 3. SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Using leadership theories to develop the fundamental concepts and skills to bridge the gap between theory and practice. Students will be able to successfully evaluate classic and contemporary leadership theories, investigate current leadership trends and identify positive applications in the dietetics community.

### **DIET 572: Current Issues or Trends**

(3-0) Cr. 3. F.S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Overview of current topics, issues, and trends in dietetics practice.

### **DIET 574: Nutrition and Immunology**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Principles and issues related to nutrition and immunology. Impact of nutrients and nutritional status on immune responses. Impact of disease states on nutritional status.

### **DIET 576: Diabetes Medical Nutrition Therapy**

Cr. 3.

*Prereq: Course in medical nutrition therapy; enrollment in GP-IDEA MFCS in Dietetics*

An in-depth study of diabetes management with emphasis in nutrition care. Topics will include diabetes pathophysiology, clinical care guidelines, basic pharmacology, clinical nutrition education and counseling strategies, and nutrition care planning.

### **DIET 597: Nutritional Aspects of Oncology**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: B.S. in nutrition, dietetics, biology, or related discipline.*

Understanding of basic cancer biology and methodology used to study nutrition and cancer relationships. Using current research as a basis, the role of nutrition in specific cancers will be explored. Students will learn about sources of information for cancer prevention programs, and how to apply this information to clinical patient management.

### **DIET 598: Clinical Aspects of Nutrition Support**

(3-0) Cr. 3. S.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Specialized nutrition assessment and support. Review of energy expenditure and substrate utilization in specific disease states. Current Methods for the initiation and management of enteral and parenteral nutrition therapy including access, metabolic and mechanical complications. Evaluation of nutrition support methodology in selected disease states.

### **DIET 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

For non-thesis option only.

## **Early Childcare Education and Programming (E C P)**

*Any experimental courses offered by E C P can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

### **E C P 201: Child Development – Ages Birth to 3**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Development from birth to age three. Major theories and research on development will be covered including growth patterns, the influences of disabilities and risk factors, environmental factors and their effects on attachment styles, language acquisition, brain development, cognitive development, social-emotional development, and perceptual and sensory motor skills.

**E C P 202: Child Development – Ages 4 to 8**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Development from ages four through eight. Major theories and research on development will be covered including growth patterns, the influences of disabilities and risk factors, environmental factors and their effects on attachment styles, language acquisition, brain development, cognitive development, social-emotional development, and perceptual and sensory motor skills.

**E C P 305: Professional Development**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Exploring the role of a professional as a teacher, administrator or advocate in early childhood programming. Students will learn about professionalism and ethics, identifying child abuse, and applying universal precautions. Discussion of qualities of the early childhood educator role, program models, and working with children and professional colleagues.

**E C P 306: Health, Safety, and Nutrition**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Important elements for planning, promoting and maintaining healthy and safe learning/care environments, understanding childhood illnesses and establishing healthy lifestyles, first aid, and care providers maintaining their own health. Maintaining safe relationships with others, including identifying and reporting abuse, neglect, and exploitation of children. Exploration of nutrients for life and feeding, food preparation and safety policies and guidelines, food allergies and intolerances, appropriate feeding practices.

**E C P 307: Child Guidance and Classroom Environments**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Working knowledge of developmentally appropriate practice in child guidance. This goal will be accomplished through review of current guidance methods and programs in order to familiarize students with successful guidance techniques. By the end of this course, students will develop their own approach to guidance based upon practices best suited to their own unique skills and strengths.

**E C P 320: Practicum I – Child Observations in Classroom Environments**

(0-6) Cr. 3.

*Prereq: E C P 201; E C P 202; E C P 305; E C P 306; E C P 307; HD FS 103*

Practicum in Early Childhood Education is an opportunity for ECP teacher candidates to have a guided learning experience in a professional agency that provides services to children and families. It is expected that learning experiences and projects at the practicum site will provide teacher candidates with the opportunity to utilize and implement theories and practices learned in other ECP classes.

**E C P 322: Diversity in the Lives of Young Children and Families**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Exploration of cultural diversity in daily life and beliefs in families with young children. The focus is on U.S. families, with attention to the multiple cultures from which they come.

**E C P 323: Working with Families**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Application of an ecological model to the understanding of variation in parental roles, perspectives, relationships, approaches, and challenges.

**E C P 324: Technology and Young Children**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Impact of electronic technology on the development of young children in educational, home, and community environments, and how technology can be used to enhance teaching and learning. Students will be critical thinkers and informed consumers of technology related to young children.

**E C P 412: Development of Curriculum for Children Ages Birth to 3**

(3-0) Cr. 3.

*Prereq: E C P 201; E C P 202; E C P 305; E C P 306; E C P 307; E C P 320*

Curriculum development related to children from birth to age 3: (1) learn and utilize assessment and documentation to inform curriculum, (2) plan and evaluate developmentally appropriate activities, and (3) learn about effective ways to share curriculum information with families. All areas of developmental domains and content areas; issues related to diversity in family composition, culture, and individual abilities will also be addressed.

**E C P 413: Development of Curriculum for Children Ages 4 to 8**

(3-0) Cr. 3.

*Prereq: E C P 201; E C P 202; E C P 305; E C P 306; E C P 307; E C P 320*

Development of curriculum for children ages 4 to 8 years: (1) learn and utilize assessment and documentation to inform curriculum, (2) plan and evaluate developmentally appropriate activities, and (3) learn about effective ways to share curriculum information with families. This course addresses all areas of developmental domains and content areas, and issues related to diversity in family composition, culture, and individual abilities will also be addressed.

**E C P 424: Assessing Young Children and Their Environments to Enhance Development**

(3-0) Cr. 3.

*Prereq: E C P 201; E C P 202; E C P 305; E C P 306; E C P 307; E C P 320*

Students will learn to select, evaluate, and use appropriate assessment tools for children birth to age 8. Students will use assessment data to inform decisions about teaching (environments and practice) and intervention. There will be an emphasis on the ethical use of assessments, validity of assessments, multicultural sensitivity, and assessments for children with special needs.

**E C P 425: Understanding and Adapting for Developmental Differences**

(3-0) Cr. 3.

*Prereq: E C P 201; E C P 202; E C P 305; E C P 306; E C P 307; E C P 320*

Knowledge of disability conditions, assessment and identification, interventions in inclusive environments, and collaborations among family members and service providers.

**E C P 440: Practicum II – Curriculum Development and Implementation**

(0-6) Cr. 3.

*Prereq: E C P 412; E C P 413; E C P 424; E C P 425*

Practicum in Early Childhood Education is an opportunity for ECE teacher candidates to have a guided learning experience in a professional agency that provides services to children and families. It is expected that learning experiences and projects at the practicum site will provide teacher candidates with the opportunity to utilize and implement theories and practices learned in other required classes.

**E C P 442: Administration and Supervision in Early Childhood Settings**

(3-0) Cr. 3.

*Prereq: HD FS 102*

Exploration of issues surrounding the administration of early childhood programs including identification of community needs, analysis of business opportunities, the evaluation and appropriate use of space and quality programming, consideration of policy and legal responsibilities, and professionalism in the field. In addition, the course explores best practices in staff selection, training, coaching, and supervision.

**E C P 460: Practicum III – Capstone Experience**

Cr. 3-6. Repeatable, maximum of 6 credits.

*Prereq: E C P 322; E C P 323; E C P 324; E C P 440; E C P 442*

Professional practicum as a 15 week experience designed to allow the student to demonstrate practical application of developmentally appropriate early childhood teaching techniques and skills, actual teaching experience and developmental feedback. Practicum students will be involved in observation and evaluation of classroom experiences, environmental design, classroom management, and parent communication.

## Ecology and Evolutionary Biology (EEB)

*Any experimental courses offered by EEB can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**EEB 511: Conceptual Foundations in Ecology and Evolutionary Biology**

(3-2) Cr. 4. Alt. F., offered even-numbered years.

*Prereq: Graduate classification*

Introduction to key figures and ideas that have shaped the development of ecology and evolutionary biology. Covers major developments in ecology and evolutionary biology at five levels of biological organization: Genome, Organism, Population, Community, and Ecosystem. Impacts of these developments on current approaches to investigation and argument formulation. Effects of technological advances on the direction of scientific investigations. Introduction to analytical skills important for critical thinking in ecology and evolutionary biology and the impact of accepted lines of scientific reasoning on the objectives and conduct of research, such as explanation and prediction, design of studies as experimentation, and structured or unstructured observation.

**EEB 585: Extended Field Trip**

(1-6) Cr. 2. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Graduate classification, permission of instructor*

Extended field trip to study major terrestrial and aquatic ecosystems. Location and duration vary. Report required.

**EEB 585A: Extended Field Trip: Pre-Trip Lecture**

(1-0) Cr. 1. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Graduate classification, permission of instructor*

Extended field trip to study major terrestrial and aquatic ecosystems. Location and duration vary. Report required.

**EEB 585B: Extended Field Trip: Travel**

(0-6) Cr. 1. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq:* Graduate classification, EEB 585A and permission of instructor.

Extended field trip to study major terrestrial and aquatic ecosystems.

Location and duration vary. Report required.

**EEB 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq:* Graduate classification and permission of instructor

For students wishing to conduct in-depth study of a particular topic in ecology and evolutionary biology.

**Courses for graduate students:****EEB 698: Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Reports and discussion of recent research and literature.

**EEB 699: Research**

Cr. arr. Repeatable. F.S.SS.

Thesis and dissertation research.

## Ecology, Evolution, and Organismal Biology (EEOB)

The department offers graduate work leading to both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees. Each EEOB faculty member is affiliated with one or more interdepartmental majors, and EEOB students major in one of these programs. These interdepartmental programs include:

- Bioinformatics and Computational Biology (<http://www.bcb.iastate.edu/>)
- Ecology and Evolutionary Biology (<http://www.eeb.iastate.edu/>)
- Environmental Science (<https://ensci.iastate.edu/>)
- Genetics and Genomics (<http://www.genetics.iastate.edu/>)
- Interdisciplinary Graduate Studies (<http://www.grad-college.iastate.edu/igs/admission.html>)
- Microbiology (<http://www.micrograd.iastate.edu/>)
- Plant Biology (<http://www.ipb.iastate.edu/>)
- Sustainable Agriculture (<https://susag.iastate.edu/>)

The department offers graduate work leading to both Master of Science (M.S.) and Doctor of Philosophy (Ph.D.) degrees.

**Any experimental courses offered by EEOB can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:****EEOB 507: Advanced Animal Behavior**

(3-0) Cr. 3. S.

*Prereq:* Graduate standing, BIOL 354, or permission of instructor

Analysis of current research in animal behavior. Topics covered may include behavioral ecology, mechanisms of behavior, evolution of behavior, applications of animal behavior to conservation biology, and applications of animal behavior to wild animals in captivity.

**EEOB 514: Life History and Reproductive Strategies**

(Dual-listed with BIOL 414). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Evolution of ecological adaptations at the individual, population, and species level. Emphasis is on evolutionary mechanisms and adaptive strategies related to life histories and reproduction; age and size at maturity; lifespan and senescence; offspring size/number trade-offs; sex and mating systems; sex determination and sex ratios. BIOL 315 or equivalent recommended.

**EEOB 521: Biological Principles of Aging**

(Dual-listed with BIOL 421). (Cross-listed with GERON). (3-0) Cr. 3. SS.

*Prereq:* BIOL 211 and BIOL 212

Basic biological principles of aging. Course modules include an introduction to the aging process, body systems and normal aging, and environment and the biology of aging. In addition, disorders and diseases of aging, prevention and treatment and exercise and aging topics will be covered.

**EEOB 531: Conservation Biology**

(Cross-listed with A ECL). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* BIOL 312; BIOL 313 or graduate standing

Examination of conservation issues from a population and a community perspective. Population-level analysis will focus on the role of genetics, demography, and environment in determining population viability. Community perspectives will focus on topics such as habitat fragmentation, reserve design, biodiversity assessment, and restoration ecology.

**EEOB 534: Endocrinology**

(Dual-listed with BIOL 434). (3-0) Cr. 3. S.

*Prereq:* BIOL 211; BIOL 212

Chemical integration of vertebrate organisms. The structure, development, and evolution of the endocrine glands and the function and structure of their hormones.



**EEOB 535: Restoration Ecology**

(Cross-listed with ENSCI, NREM). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* BIOL 366 or BIOL 474 or graduate standing

Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

**EEOB 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**EEOB 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**EEOB 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**EEOB 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**EEOB 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**EEOB 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**EEOB 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**EEOB 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**EEOB 546: Computational Skills for Biological Data**

(Cross-listed with BCB). Cr. 3. F.

*Prereq:* Graduate student status or permission of the instructor

Computational skills necessary for biologists working with big data sets. UNIX commands, scripting in R and Python, version control using Git and GitHub, and use of high performance computing clusters. Combination of lectures and computational exercises.

**EEOB 551: Plant Evolution and Phylogeny**

(Dual-listed with BIOL 451). (3-3) Cr. 4. Alt. F., offered even-numbered years.

*Prereq:* BIOL 315 or equivalent.

Survey of land plant evolution; phylogenetic comparison of anatomical, reproductive, and life history specializations. Relationships among bryophytes, lycophytes, pteridophytes, gymnosperms, and angiosperms emphasizing significant evolutionary changes documented by paleobotanical, morphological, and molecular studies.

**EEOB 553: Agrostology**

(2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* BIOL 366 or equivalent.

Structure, identification, classification, phylogeny, and economic aspects of grasses and related families.

**EEOB 555: Bryophyte and Lichen Biodiversity**

(Dual-listed with BIOL 455). (2-3) Cr. 3. S.

*Prereq: BIOL 211; BIOL 211L*

Introduction to the biology and ecology of mosses, liverworts, and lichens. Emphasis on identification and diversity of local representatives of these three groups of organisms. Required field trips and service-learning.

**EEOB 561: Evolutionary and Ecological Genomics**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Permission of instructor; BCBIO 444 recommended.*

Use of genomic and other "omic" data in evolution and ecology. Review of data-generation platforms, computational methods, and examples of how phylogenomics, metagenomics, epigenomics, and population genomics are transforming the disciplines of evolution and ecology.

**EEOB 562: Evolutionary Genetics**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Permission of instructor*

Seminar/discussion course covering the genetic basis of evolutionary processes in multicellular organisms.

**EEOB 563: Molecular Phylogenetics**

(2-3) Cr. 3. S.

*Prereq: BIOL 313 and BIOL 315*

An overview of the theory underlying phylogenetic analysis and the application of phylogenetic methods to molecular datasets. The course emphasizes a hands-on approach to molecular phylogenetics and combines lecture presentations with computer exercises and discussion of original scientific literature.

**EEOB 564: Wetland Ecology**

(Dual-listed with BIOL 464). (Cross-listed with ENSCI). (3-0) Cr. 3. S.

*Prereq: 15 credits in biological sciences.*

Ecology, classification, creation and restoration, and management of wetlands. Emphasis on North American temperate wetlands.

**EEOB 565: Macroevolution**

(Dual-listed with BIOL 465). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 315*

The history and diversity of life on earth; evolutionary patterns and processes above the species level. Diversity from a phylogenetic perspective. Empirical exercises include: phylogeny estimation, ancestral states, estimating diversification rates, evaluating the tempo and mode of evolution, biogeographic patterns, and trait associations across the tree of life.

**EEOB 566: Molecular Evolution**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of instructor*

Seminar/discussion course covering the fundamentals of molecular evolution. Emphasis is placed on original scientific literature and current topics, including rates and patterns of genetic divergence; nucleotide and allelic diversity; molecular clocks; gene duplications; genome structure; organellar genomes; polyploidy; transposable elements; and modes and mechanisms of gene and genome evolution.

**EEOB 567: Empirical Population Genetics**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: Permission of instructor*

An overview of fundamental population genetic theory and the ecological and evolutionary factors underlying the distribution of genetic variation within and among natural populations. Emphasis on the analysis of inbreeding, breeding systems, parentage, relatedness, spatial autocorrelation, effective population size, hierarchical population models, and phylogeography.

**EEOB 568: Advanced Systematics**

(Cross-listed with ENT). (2-3) Cr. 3. Alt. S., offered irregularly.

*Prereq: Permission of instructor*

Principles and practice of systematic biology; taxonomy, nomenclature and classification of plants and animals; sources and interpretation of systematic data; speciation; fundamentals of phylogenetic systematics.

**EEOB 569: Biogeography**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: BIOL 315 or equivalent; permission of instructor*

Principles underlying the geographic distribution of organisms throughout the world; biological influences of geological history and tectonic movements; role of climate, migration, dispersal, habitat, and phylogeny on past and present organismal distribution patterns; biogeographic methods.

**EEOB 576: Functional Ecology**

(Dual-listed with BIOL 476). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

The nature of adaptations to physical and biotic environments. Biophysical, biomechanical, and physiological bases of the structure, form, growth, distribution, and abundance of organisms.

**EEOB 577: Concepts in Theoretical Ecology and Evolution**

(2-0) Cr. 1. Alt. F., offered even-numbered years.

Readings and discussion of influential ideas in ecological and evolutionary theory, with an emphasis on how models are used as conceptual tools for building synthetic paradigms. Topics are chosen according to student interests; may include spatial ecology, behavioral theory, chaos, community assembly and biodiversity, and others.

**EEOB 584: Ecosystem Science**

(Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Combined 12 credits in biology, chemistry, and physics.*

Advanced studies of ecosystems and the biological and physical factors that influence their properties and dynamics. Conceptual foundations and modern approaches to ecosystem studies. Interactions among organisms, biological diversity, and ecosystem attributes. Quantitative analyses of accumulations, transformations, and fluxes of nutrients, water, and energy within and among ecosystems. Global change issues.

**EEOB 585: Community Ecology**

(Dual-listed with BIOL 485). (3-0) Cr. 3. S.

*Prereq: BIOL 312*

The effect of interspecific interactions on the structure and dynamics of natural and managed communities; including concepts of guild structure and trophic web dynamics and their importance to the productivity, diversity, stability, and sustainability of communities. The implications of interspecific interactions in the management of wild species will be emphasized with illustrative case histories of interactions between plants, invertebrates, and vertebrates.

**EEOB 586: Aquatic Ecology**

(Dual-listed with BIOL 486). (Cross-listed with A ECL, ENSCI). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**EEOB 586L: Aquatic Ecology Laboratory**

(Dual-listed with BIOL 486L). (Cross-listed with A ECL, ENSCI). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**EEOB 587: Microbial Ecology**

(Dual-listed with BIOL 487). (Cross-listed with ENSCI, GEOL, MICRO). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**EEOB 589: Population Ecology**

(Dual-listed with BIOL 489). (Cross-listed with A ECL). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 312, STAT 101 or STAT 104, a course in calculus, or graduate standing*

Concepts and theories of population dynamics with emphasis on models of growth, predation, competition, and regulation.

**EEOB 590A: Special Topics: Current Topics in Ecology**

Cr. 1-3. Repeatable.

*Prereq: 10 credits in biology, permission of instructor*

**EEOB 590B: Special Topics: Current Topics in Evolutionary Biology**

Cr. 1-3. Repeatable.

*Prereq: 10 credits in biology, permission of instructor*

**EEOB 590C: Special Topics: Current Topics in Organismal Biology**

Cr. 1-3. Repeatable.

*Prereq: 10 credits in biology, permission of instructor*

**EEOB 596: Ecology and Society**

(Cross-listed with PHIL). (3-0) Cr. 3.

*Prereq: Graduate classification in biological or environmental sciences/studies with at least one course in ecology*

Analysis of conceptual and methodological debates in ecology. Historical development of competing research traditions and philosophies. Topics include i) methodological issues in ecological science, ii) conceptual issues in theoretical ecology, iii) conceptual issues in applied ecology, iv) relation of ecology to environmental and social issues.

**EEOB 599: Creative Component**

Cr. arr.

Research toward nonthesis master's degree.

**Courses for graduate students:**
**EEOB 698: Seminar**

Cr. 1. Repeatable.

Meetings of graduate students and faculty to discuss recent literature and problems under investigation.

**EEOB 699: Research**

Cr. arr. Repeatable.

Research for thesis or dissertation. Offered on a satisfactory-fail basis only.

## Early Childhood and Family Policy (ECFP)

*Any experimental courses offered by ECFP can be found*

*at:* [registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**ECFP 550: History of Child Development and Equity**

(3-0) Cr. 3. F.

Overview of research on children birth to age five, demographics of this population, critical domains of development, significance of early brain development, and issues of inequality and disproportionality that shape child outcomes.

**ECFP 560: Examining Practices, Policies, and Key Issues**

(3-0) Cr. 3. F.

Advances general early childhood education and care (ECEC) policy knowledge and addresses contextual and historical variables that have affected its evolution in the United States. Overview of the practices, policies, and issues framing the design and delivery of contemporary early childhood education and care (ECEC), including the role of parents and families. Addresses understanding ECEC practice and policy and identifying and addressing critical policy challenges.

**ECFP 570: Theory, Analysis & Research**

(3-0) Cr. 3. S.

*Prereq: ECFP 550*

Provides interdisciplinary perspective on early childhood education and care (ECEC) policy. Focus on research influence on policy, tools for policy analysis, and theoretical frames used to interpret and influence current ECEC policy discourse. Examine and analyze design, implementation, and outcomes of various policies.

**ECFP 580: Policy, Leadership & Advocacy**

(3-0) Cr. 3. S.

*Prereq: ECFP 550*

Provides foundational knowledge of fundamentals of policy creation, design, and development. Emphasis on policies that impact early childhood education and care (ECEC) and focus on policy construction.

## Economics (ECON)

*Any experimental courses offered by ECON can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**ECON 101: Principles of Microeconomics**

(3-0) Cr. 3. F.S.SS.

Resource allocation, opportunity cost, comparative and absolute advantage. Supply and demand. Marginal analysis. Theories of production and consumption, pricing, and the market system. Perfect and imperfect competition and strategic behavior. Factor markets. Present discounted value.

**ECON 101H: Principles of Microeconomics: Honors**

(3-0) Cr. 3.

*Prereq: Admission to the Honors program*

Resource allocation, opportunity cost, comparative and absolute advantage. Supply and demand. Marginal analysis. Theories of production and consumption, pricing, and the market system. Perfect and imperfect competition and strategic behavior. Factor markets. Present discounted value.

**ECON 101L: Laboratory in Principles of Microeconomics**

(0-2) Cr. 1. F.

*Prereq: Concurrent enrollment in the appropriate section of ECON 101*

Discussion of material typically covered in Econ 101. Application of economic principles to real world problems. Economic principles and basic business management concepts applied to decision-making in agribusiness operations.

**ECON 102: Principles of Macroeconomics**

(3-0) Cr. 3. F.S.SS.

Measurement of macro variables and general macro identities. Classical models of full employment. Production and growth. Savings and investment. Employment and unemployment. Money, inflation, and price levels. Operation of the U.S. banking system. Fiscal and monetary policy. Elements of international finance. ECON 101 recommended.

**ECON 102H: Principles of Macroeconomics: Honors**

(3-0) Cr. 3.

*Prereq: Admission to the Honors program*

Measurement of macro variables and general macro identities. Classical models of full employment. Production and growth. Savings and investment. Employment and unemployment. Money, inflation, and price levels. Operation of the U.S. banking system. Fiscal and monetary policy. Elements of international finance. ECON 101 recommended.

**ECON 110: Orientation in Agricultural Business**

(1-0) Cr. 1. F.

Orientation course for freshman and new transfer students in agricultural business.

**ECON 207: Applied Economic Optimization**

(2-2) Cr. 3. F.S.

*Prereq: MATH 151 or MATH 160 or MATH 165*

Application of linear algebra, calculus and unconstrained and constrained optimization techniques to economic problems. Learning outcomes include the ability to (i) identify the objective, decision variables and constraints in economic decision problems, (ii) represent elements of an economic problem in simple mathematical models, (iii) identify and apply mathematical tools that can be used to solve the problems, (iv) identify the strengths and limitations of the solution method, and (v) interpret the economic meaning and implications of the solution.

**ECON 230: Farm Business Management**

(2-2) Cr. 3. F.S.

*Prereq: ACCT 284; ECON 101*

Business and economic principles applied to decision making and problem solving in the management of a farm business. Cash flow, partial, enterprise, and whole farm budgeting. Information systems for farm accounting, analysis, and control. Obtaining and managing land, capital, and labor resources. Alternatives for farm business organization and risk management.

**ECON 234: Small Business Management**

(3-0) Cr. 3.

*Prereq: ECON 101*

An introduction to small business management, entrepreneurship, and economics utilizing a series of case studies. Exploration of issues related to starting or acquiring a new business and development of knowledge and skills for successful management of a small business, with an emphasis on agricultural business.

**ECON 235: Introduction to Agricultural Markets**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101*

Basic concepts and economics principles related to markets for agricultural inputs and products. Overview of current marketing problems faced by farms and agribusinesses, farm and retail price behavior, structure of markets, food marketing channels, food quality and food safety, and the role of agriculture in the general economy. The implications of consumer preferences at the farm level. Introduction to hedging, futures, and other risk management tools.

**ECON 236: Agricultural Selling**

(3-0) Cr. 3.

*Prereq: ECON 101*

Principles of selling with application to agricultural and food related businesses. Attitudes, value systems, and behavioral patterns that relate to agricultural sales. Marketing, selling strategies, preparing for sales calls, making sales presentations, handling objections, and closing sales. Analysis of the buying or purchasing process. Evaluation of agri-selling profession.

**ECON 292: Career Seminar**

(1-0) Cr. 1.

*Prereq: Major in economics or agricultural business*

Career opportunities in the various industries and government institutions. Required training and skills needed to perform successfully in different types of careers. Factors important in finding and obtaining employment either before or after graduation including personal resumes, interviewing, and letter writing. Only one of ECON 292, 292A, and 292B can be used toward graduation.

**ECON 292A: Career Seminar: Agricultural Business**

(1-0) Cr. 1.

*Prereq: Major in economics or agricultural business*

Career opportunities in the various industries and government institutions. Required training and skills needed to perform successfully in different types of careers. Factors important in finding and obtaining employment either before or after graduation including personal resumes, interviewing, and letter writing. Only one of ECON 292, 292A, and 292B can be used toward graduation.

**ECON 292B: Career Seminar: Economics and Business Economics**

(1-0) Cr. 1.

*Prereq: Major in economics or business economics*

Career opportunities in the various industries and government institutions. Required training and skills needed to perform successfully in different types of careers. Factors important in finding and obtaining employment either before or after graduation including personal resumes, interviewing, and letter writing. Only one of ECON 292, 292A, and 292B can be used toward graduation.

**ECON 297: Internship**

Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Permission of Instructor; major in agricultural business or economics*

Students complete a research report, based on their internship or approved work experience, that examines chosen topics in management, marketing or finance. Offered on a satisfactory-fail basis only.

**ECON 298: Cooperative Education**

Cr. R. Repeatable.

*Prereq: Permission of the Department Cooperative Education Coordinator; Sophomore classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**ECON 301: Intermediate Microeconomics**

(3-0) Cr. 3-4. F.S.SS.

*Prereq: ECON 101; (ECON 207 or MATH 166)*

Theory of consumer and business behavior; optimal consumption choices and demand; theory of firm behavior; costs, production, and supply; competitive and imperfectly competitive markets; theory of demand for and supply of factors of production; general equilibrium analysis. Fall and spring require recitation and are 4 credits; summer is 3.0 credits.

**ECON 301H: Intermediate Microeconomics: Honors**

(3-0) Cr. 3-4.

*Prereq: ECON 101; (ECON 207 or MATH 166)*

Theory of consumer and business behavior; optimal consumption choices and demand; theory of firm behavior; costs, production, and supply; competitive and imperfectly competitive markets; theory of demand for and supply of factors of production; general equilibrium analysis. Recitation required for 4 credits.

**ECON 302: Intermediate Macroeconomics**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101; ECON 102; (MATH 160 or MATH 165)*

Theory of income, employment, interest rates, and the price level; fiscal and monetary policy; budget and trade deficits; money and capital inflows, interest rates, and inflation.

**ECON 302H: Intermediate Macroeconomics: Honors**

(3-0) Cr. 3.

*Prereq: ECON 101; ECON 102; (MATH 160 or MATH 165)*

Theory of income, employment, interest rates, and the price level; fiscal and monetary policy; budget and trade deficits; money and capital inflows, interest rates, and inflation.

**ECON 313: Economics of Sports**

(3-0) Cr. 3.

*Prereq: ECON 101*

Application of economics to issues in sports, including franchising; rival leagues and barriers to entry; cooperative, competitive, and collusive behavior; player productivity and compensation; contracts, unions, and discrimination; antitrust, taxation, and subsidies. Economic concepts include supply and demand, costs, competition, time value of money, labor economics, pricing, public finance, production, game theory, risk analysis, and industrial organization.

**ECON 320: Labor Economics**

(3-0) Cr. 3.

*Prereq: ECON 101*

Economic analysis of contemporary domestic and international labor market issues including labor supply and demand, unemployment, and employment in the U.S. and elsewhere; investments in and returns to education, training, health, immigration and migration; income inequality; labor productivity; out-sourcing and global competitiveness; work incentives; compensation including benefits; and labor policies such as minimum wages, over-time pay, discrimination, unions, and immigration. Examples drawn from the U.S. and other developed countries with reference to developing countries where relevant.

Meets International Perspectives Requirement.

**ECON 321: Economics of Discrimination**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: ECON 101*

Economic theories of discrimination. Analysis of the economic problems of women and minorities in such areas as earnings, occupations, and unemployment. Public policy concerning discrimination. Poverty measurement and antipoverty programs in the U.S.

**ECON 330: Advanced Farm Business Management**

(3-0) Cr. 3.

*Prereq: ECON 230*

Effective use of strategic planning, decision methods, and computer assistance for solving farm problems. Applications of economic and management theory to analyze farm business decisions using efficiency measures to assess current resource use and direct the farm business analysis, planning, and tax process.

**ECON 332: Cooperatives**

(3-0) Cr. 3.

*Prereq: ECON 101*

Survey of cooperative business structure, including historical developments in the United States, principles of cooperation, state and federal authorization for cooperative activity, economic motivations and foundations, governance, marketing and pricing strategies, and financing, capitalization and taxation considerations. Students will learn how the cooperative model is applied in a variety of markets.

**ECON 334: Entrepreneurship in Agriculture**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101*

Introduction to the process of entrepreneurship within the agricultural and food sectors. Emphasis on opportunity recognition and creation of concept for new startup ventures. Students will develop a business plan for a startup business or non-profit organization.



**ECON 335: The Economics of Global Agricultural Food and Bio-energy**  
(Cross-listed with GLOBE). (3-0) Cr. 3.

*Prereq: ECON 101*

Applied economic analysis of the determinants of world agricultural production, marketing, and use in feed, food, fiber, biofuel, and other applications, and global food processing and consumption. Analysis of market case studies and various data on global agricultural production and transformation, land and resource use, demography, economic activity, nutrition and health trends.

Meets International Perspectives Requirement.

**ECON 337: Agricultural Marketing**

(3-0) Cr. 3.

*Prereq: ECON 101*

Understanding of agricultural commodity markets for grain, livestock and dairy with emphasis on marketing decisions and risk management for farmers and processors. Hands-on applications of marketing and management tools via market simulations. ECON 235 recommended.

**ECON 344: Public Finance**

(3-0) Cr. 3.

*Prereq: ECON 101*

The economic role of governments in market economies. Public goods, externalities, income distribution, and income maintenance programs. The effect of taxes on economic behavior, descriptions of the structure of the principal U.S. taxes, and current reform proposals.

**ECON 353: Money, Banking, and Financial Institutions**

(3-0) Cr. 3. F.S.

*Prereq: ECON 101; ECON 102*

Theoretical and applied analysis of money, banking, and financial markets; interest rates and portfolio choice; the banking industry in transition; the money supply process; the Federal Reserve System and the conduct of monetary policy; macro implications of monetary policy; international finance.

**ECON 355: International Trade and Finance**

(3-0) Cr. 3.

*Prereq: ECON 101; ECON 102*

Explanations of causes of international trade and the impact of trade on welfare and employment patterns. Analysis of government policies towards trade, such as tariffs, quotas, and free trade areas. Theory of balance of payments and exchange rate determination, and the role of government policies. Examination of alternative international monetary arrangements.

Meets International Perspectives Requirement.

**ECON 362: Applied Ethics in Agricultural Business**

(3-0) Cr. 3.

*Prereq: ECON 101; Junior or Senior classification; College of Agriculture and Life Sciences major*

Explore ethics of management and decision-making in agriculture and agricultural business. Discuss and debate proper ethical behavior in these issues and situations and the relationship between business and personal ethical behavior.

**ECON 364: Rural Property Appraisal**

(3-0) Cr. 3.

*Prereq: ECON 101*

Use of income capitalization, sales comparison and cost appraisal concepts in appraising agricultural resources. Application of underlying economic/business/management principles, especially present value, as they relate to farmland appraisal. Determination and estimation of economic impacts of special consideration and property use factors. Evaluate feasibility and profitability of investment in rural property.

**ECON 371: Introductory Econometrics**

(4-0) Cr. 4. F.S.

*Prereq: ECON 301; (ECON 302 or ECON 353); STAT 326*

Introduction to the models and methods used to estimate relationships and test hypotheses pertaining to economic variables. Among the topics covered in the course are: Single and multiple regression analysis; functional forms; omitted variable analysis; multicollinearity; heteroskedasticity; autocorrelation; simultaneous equations; and dynamic models.

**ECON 376: Rural, Urban and Regional Economics**

(Cross-listed with C R P). (3-0) Cr. 3.

*Prereq: ECON 101*

Firm location with respect to regional resources, transport, scale economies, externalities, and policies. Measures of local comparative advantage and specialization. Spatial markets. Population location considering jobs, wages, commuting, and local amenities. Business, residential, and farm land use and value. Migration. Other topics may include market failure, regulation, the product cycle, theories of rural and urban development, developmental policy, firm recruiting, local public goods and public finance, schools, poverty, segregation, and crime.

**ECON 380: Energy, Environmental and Resource Economics**

(Cross-listed with ENV S). (3-0) Cr. 3.

*Prereq: ECON 101*

Natural resource availability, use, conservation, and government policy, with emphasis on energy issues. Environmental quality and pollution control policies.

**ECON 385: Economic Development**

(Cross-listed with GLOBE). (3-0) Cr. 3.

*Prereq: ECON 101; ECON 102*

Current problems of developing countries, theories of economic development, agriculture, and economic development, measurement and prediction of economic performance of developing countries, alternative policies and reforms required for satisfying basic needs of Third World countries, interrelationships between industrialized countries and the developing countries, including foreign aid.

Meets International Perspectives Requirement.

**ECON 387: Economies of China and India**

(3-0) Cr. 3.

*Prereq: ECON 101*

The economic development of China and India within the larger historical, political, and socioeconomic contexts. The characteristics of the development paths of major industries. The drivers of and impediments for future economic development. The two economies' connections with the world economy.

Meets International Perspectives Requirement.

**ECON 398: Cooperative Education**

Cr. R.

*Prereq: Permission of Department Cooperative Education Coordinator; Junior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**ECON 401: Topics in Microeconomics**

(3-0) Cr. 3.

*Prereq: ECON 301; STAT 226*

Advanced treatment of selected topics from one or more of the following areas: household production models, factor markets, game theory and imperfect competition, general equilibrium, intertemporal choice, asset markets, income distribution, externalities and public goods, etc.

**ECON 402: Topics in Macroeconomics**

(3-0) Cr. 3.

*Prereq: ECON 301; (ECON 302 or ECON 353); STAT 226*

Advanced treatment of selected topics from one or more of the following areas: business cycle theory, growth theory, fiscal and monetary policy, coordination issues, open economy macroeconomics, and financial economics.

**ECON 416: Industrial Organization**

(3-0) Cr. 3.

*Prereq: ECON 301*

Study of the structure of firms and markets and of their interaction, with emphasis on imperfectly competitive markets. Behavior of firms in strategic settings and insights of basic game-theoretic models. Welfare implications of alternative market organizations, consequences of market power, and scope for government regulation and antitrust/competition policies. Topics include monopoly and price discrimination, oligopoly models, product quality, product differentiation, vertical integration, information and advertising, patents, R&D and innovation, and regulation.

**ECON 418: Introduction to Game Theory**

(3-0) Cr. 3.

*Prereq: ECON 301*

Systematic introduction to game theory and its uses in economics. Develops the basic framework, models and tools necessary to analyze games of strategy, including: Strategic and extensive-form representations of games; best response functions and Nash equilibrium, mixed strategies backward induction and subgame-perfect equilibrium, imperfect and incomplete information, Bayesian and sequential equilibria. Examples and applications taken from economics, business, political science, law and biology.

**ECON 431: Managerial Economics**

(3-0) Cr. 3.

*Prereq: ECON 301*

Theory of the firm; organizational incentives and efficiency; moral hazard; role of information and decision making under uncertainty; ownership and control; business investment.

**ECON 435: Analysis of Food Markets**

(Cross-listed with FS HN). Cr. 3. S.

*Prereq: ECON 235; ECON 301; STAT 226*

Food market analysis from an economics perspective; food markets and consumption; methods of economic analysis; food industry structure and organization; food and agriculture regulations; labeling; consumer concerns; agricultural commodity promotion. Final project required.

**ECON 437: Commodity Marketing and Risk Management**

(3-0) Cr. 3.

*Prereq: ECON 235; ECON 301; STAT 326*

The purpose and performance of commodity markets. How commodity marketing institutions function. Merchandising arrangements. Distinguishing features of agricultural commodities. Hedging, arbitrage, and speculation in commodity spot, forward, futures, and options markets. Valuation theory.

**ECON 455: International Trade**

(3-0) Cr. 3.

*Prereq: ECON 301*

Rigorous treatment of theories of international trade and international factor movements. Examination of the impact of trade and labor migration on domestic and world welfare and on the distribution of income. Theoretical analysis of government policies towards trade and factor movements, including quotas, tariffs, free trade areas and immigration restrictions. Discussion of contemporary issues and controversies concerning globalization, including multinational firms and labor migration.

Meets International Perspectives Requirement.

**ECON 457: International Finance**

(Dual-listed with ECON 557). (3-0) Cr. 3.

*Prereq: ECON 302*

National income accounting and balance of payments; foreign exchange rates and exchange rate markets; money, interest rates, and exchange rate determination; prices, exchange rates, and output in the short run; international monetary arrangements; fixed versus flexible exchange rates; optimal currency areas; international capital flows; currency and financial crises in emerging markets. Does not count towards Ph.D. requirements.

Meets International Perspectives Requirement.

**ECON 460: Agricultural, Food, and Trade Policy**

(Dual-listed with ECON 560). (3-0) Cr. 3.

*Prereq: ECON 301 or ECON 501*

Description and analysis of economic problems of U.S. agriculture. Explanation and economic analysis of government policies and programs to develop agriculture, conserve agricultural resources, address consumer food concerns, stabilize farm prices, and raise farm incomes. The influence of macropolicy, world economy, international trade, and bioenergy on U.S. agriculture.

**ECON 466: Agricultural Finance**

(3-0) Cr. 3.

*Prereq: ECON 301; FIN 301; STAT 226*

Financial analysis of agricultural businesses; liquidity, capital structure, and growth and risk of agricultural firms; capital budgeting methods; analysis of land investments, leasing, and costs of credit; financial intermediation and major financial institutions for agriculture; borrower-lender relationships, and asset-liability management techniques by financial intermediaries; public policies affecting agricultural credit markets. ECON 353 recommended.

**ECON 480: Intermediate Environmental and Resource Economics**

(Dual-listed with ECON 580). (3-0) Cr. 3.

*Prereq: ECON 301*

Theories of natural resource utilization and allocation. Externalities, public goods, and environmental quality. Renewable energy, biofuels, land use change and life cycle analysis of carbon, and sustainability and resource conservation. Methodologies for analyzing natural resource and environmental problems and evaluating resource policies.

**ECON 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 6 credits.

*Prereq: Junior or Senior classification; 14 credits in ECON; Permission of Instructor*

Offered on a satisfactory-fail basis only. No more than 9 credits of Econ 490 may be used toward graduation

**ECON 490E: Independent Study: Entrepreneurship**

Cr. 1-5. Repeatable, maximum of 6 credits.

*Prereq: Junior or Senior classification; 14 credits in ECON; Permission of Instructor*

Offered on a satisfactory-fail basis only. No more than 9 credits of Econ 490 may be used toward graduation

**ECON 490H: Independent Study: Honors**

Cr. 1-5. Repeatable, maximum of 6 credits.

*Prereq: Junior or Senior classification; 14 credits in ECON; Permission of Instructor*

Offered on a satisfactory-fail basis only. No more than 9 credits of Econ 490 may be used toward graduation

**ECON 492: Graduating Senior Survey**

Cr. R.

*Prereq: Graduating senior*

Final preparations for graduation. The final stages of job searching, interviewing, letter writing, and resume preparation. Outcomes assessment information from graduating seniors including opinion surveys, instructor/advisor/course evaluations, exit interviews, student accomplishment surveys, job placement surveys, and comprehensive skills examinations. Departmental recognition of graduating seniors. Life as an alumnus - expectations and obligations. Convocation and commencement information. Offered on a satisfactory-fail basis only.

**ECON 495: Economics Domestic Travel Course**

Cr. 1-3.

*Prereq: Sophomore classification; Permission of Instructor*

Tour and study of domestic businesses, markets, and economic institutions located outside Iowa to expose students to the diversity of activities within the U.S. economy. Pre-trip sessions arranged. Locations and duration of tours will vary.

**ECON 496: Economics International Travel Course**

Cr. 1-3. Repeatable.

*Prereq: Sophomore classification; Permission of Instructor*

Tour and study of international agricultural and/or nonagricultural economies, markets, and institutions. Locations and duration of tours will vary. Limited enrollment.

Meets International Perspectives Requirement.

**ECON 498: Cooperative Education**

Cr. R.

*Prereq: Permission of the Department Cooperative Education Coordinator; Senior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ECON 500: Quantitative Methods in Economic Analysis I**

(4-0) Cr. 4. F.

*Prereq: ECON 301; MATH 160 or MATH 165; MATH 166 or ECON 207; one of STAT 326, STAT 341, or ECON 371; and permission of Director of Graduate Education*

Economic applications of selected mathematical and statistical concepts: linear models and matrix algebra; differential calculus and optimization; integral calculus and economic dynamics; probability distributions, estimation, and hypothesis testing in the analysis of economic data. The best math preparation is a full year of calculus.

**ECON 501: Microeconomics**

(4-0) Cr. 4. F.

*Prereq: ECON 301, credit or enrollment in ECON 500 or equivalent background in calculus and statistics*

The theory of the consumer, theory of the firm, perfect and imperfect competition, welfare economics, and selected topics in general equilibrium and uncertainty.

**ECON 502: Macroeconomics**

(4-0) Cr. 4. F.

*Prereq: ECON 302, credit or enrollment in ECON 500 or equivalent background in calculus and statistics*

Models of aggregate supply and demand, theories of consumption and investment, money supply and demand, inflation, rational expectations, stabilization policy, financial markets, and international finance.

**ECON 509: Applied Numerical Methods in Economics**

(3-0) Cr. 3.

*Prereq: ECON 500, ECON 501; or ECON 600, ECON 601*

Use of numerical techniques to solve economic problems. Numerical differentiation and integration numeric solutions of systems of equations, static and dynamic optimization problems including unconstrained optimization, maximum likelihood methods, general nonlinear programming methods, dynamic programming and optimal control, numerical methods for solving functional equations.

**ECON 510: Experimental Economics**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 601*

Introduction to experimental economics and major subject areas addressed by laboratory and field experiments. Exploration of experimental methods by concentrating on series of experiments. Applications include individual decision-making, behavioral game theory, markets, behavioral labor, public and development economics, social network, and neuroeconomics. Research project.

**ECON 520: Labor Supply and Human Capital Formation**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 601*

Labor supply decisions and empirical analysis for agricultural operators and other self-employed and wage-earning households; multiple job holding; resource allocation in productive households; human capital formation by households, firms, and public institutions, which includes schooling, on-the-job training, migration, health, research, raising of children, and implications for household income and welfare; applications to problems in rural areas of developing and developed countries.

**ECON 531: Trends Impacting Agri-Food Businesses**

Cr. 2. F.

*Prereq: Enrollment in The Ivy Executive MBA program within the Ivy College of Business at Iowa State University.*

Explore trends impacting agricultural and food businesses. Video interviews with a range of entrepreneurs, investors and industry experts will expose students to a variety of ideas and opinions on the most important trends and issues impacting the future structure of agri-food markets and explore the implications for agri-food businesses. In addition, students will be challenged to develop their own ideas about how these trends will impact their business and career.

**ECON 532: Managerial Economics for the Global Organization**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA or BAS program; not for economics majors*

Applications of microeconomic theory and decision analysis for firms operating in U.S. and internationally. Topics include demand & supply, consumer choice theory, production and cost theory, short run and long run business decisions, input cost and human capital differences across countries, empirical estimation of demand and supply, pricing, exchange rates, government and business, market structures and strategy.

**ECON 537: Commodity Markets: Analysis and Strategy**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 532 or ECON 601, ECON 571 or STAT 326*

Analysis of exchange-traded and over-the-counter commodity markets, their functions and performance. Evaluation of hedging, speculation, and arbitrage strategies. Commodity transformation over space and time. Valuation of derivatives and comparison with derivatives on financial assets. Efficiency and the role of information in commodity markets. Market regulation.

**ECON 545: Public Economics**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 601*

Economic justifications for government activities; illustrative theoretical and empirical analyses of expenditure programs; foundations of excess burden, incidence analysis, and optimal taxation; effects of taxation on labor supply; public goods and externalities; social insurance; introduction to economics of the health sector with an emphasis on the role of market failures.

**ECON 557: International Finance**

(Dual-listed with ECON 457). (3-0) Cr. 3.

*Prereq: ECON 302*

National income accounting and balance of payments; foreign exchange rates and exchange rate markets; money, interest rates, and exchange rate determination; prices, exchange rates, and output in the short run; international monetary arrangements; fixed versus flexible exchange rates; optimal currency areas; international capital flows; currency and financial crises in emerging markets. Does not count towards Ph.D. requirements.

Meets International Perspectives Requirement.

**ECON 560: Agricultural, Food, and Trade Policy**

(Dual-listed with ECON 460). (3-0) Cr. 3.

*Prereq: ECON 301 or ECON 501*

Description and analysis of economic problems of U.S. agriculture. Explanation and economic analysis of government policies and programs to develop agriculture, conserve agricultural resources, address consumer food concerns, stabilize farm prices, and raise farm incomes. The influence of macropolicy, world economy, international trade, and bioenergy on U.S. agriculture.

**ECON 571: Intermediate Econometrics**

(3-2) Cr. 4. S.

*Prereq: ECON 500*

Single and multiple equation regression models; dummy explanatory variables; serial correlation; heteroskedasticity; distributed lags; qualitative dependent variables; simultaneity. Use of econometric models for tests of economic theories and forecasting.

**ECON 576: Spatial Economics**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 601*

Analysis of location choice by firms, employees, and households emphasizing the role of spatial variations in agglomeration economies, economies of scale, distance, transport, endowments, amenities, and local government. Models of land use, urban form, spatial competition, central place theory, and migration. Techniques of discrete choice analysis, statistical analysis of categorical data, urban system modeling, and interregional computable general equilibrium.

**ECON 580: Intermediate Environmental and Resource Economics**

(Dual-listed with ECON 480). (3-0) Cr. 3.

*Prereq: ECON 301*

Theories of natural resource utilization and allocation. Externalities, public goods, and environmental quality. Renewable energy, biofuels, land use change and life cycle analysis of carbon, and sustainability and resource conservation. Methodologies for analyzing natural resource and environmental problems and evaluating resource policies.

**ECON 581: Advanced Environmental Economics**

(3-0) Cr. 3.

*Prereq: ECON 501 or ECON 601*

Interrelationships of natural resource use and the environment. Applied welfare and benefit-cost analyses. Externalities and pollution abatement. Nonmarket valuation of resources. Property rights. Legal and social constraints. Policy approaches.

**ECON 590: Special Topics**

Cr. 1-5. Repeatable.

Offered on a satisfactory-fail basis only.

**ECON 594: Research Methods in Economics I**

(1-0) Cr. 1. F.

*Prereq: Graduate classification or permission of instructor*

Introduction to methods used in empirical economic research.

Formulation of well-posed economic questions, locating and evaluating relevant literature, and meaning of testable hypotheses.

**ECON 595: Research Methods in Economics II**

(1-0) Cr. 1. S.

*Prereq: Graduate classification or Permission of the Instructor*

Develop skills required to successfully acquire, manipulate and analyze data that can be used for conducting empirical economic research.

Topics include research design, developing workflows that support reproducible analysis, data visualization and related issues. Hands on work with one or more example data sets to gain experience and confidence in using statistical software and interpreting the results of this analysis.

**ECON 596: Research Methods in Economics III**

(1-0) Cr. 1. S.

*Prereq: Graduate classification or Permission of the Instructor*

Formulation of the research question, problem identification, literature review, data identification, formulation and testing of hypotheses, and presentation of research results. Lectures will build on assigned readings, and cover components of applied economic research, and writing skills. Student research presentations and lectures by invited speakers. Students develop their creative component in a "hands on" environment where the instructor and others can offer guidance.

**ECON 599: Creative Component**

Cr. 1-5.

Offered on a satisfactory-fail basis only.

**Courses for graduate students:****ECON 601: Microeconomic Analysis I**

(4-1) Cr. 4. F.

*Prereq: ECON 301 and permission of Director of Graduate Education*

Economic theory and methodology; theory of consumer behavior, theory of the competitive firm, supply and factor demand; duality relations in consumer and producer theory, welfare change measures; partial equilibrium analysis, perfect competition, monopoly; choice under uncertainty, the expected utility model, risk aversion; insurance, portfolio and production decisions under risk.

**ECON 602: Macroeconomic Analysis**

(4-1) Cr. 4. S.

*Prereq: ECON 301, ECON 302, and permission of Director of Graduate Education*

Neoclassical aggregate growth models; the overlapping generations model; endogenous growth models; equilibrium business cycle theories; equilibrium job search and matching; models of money; fiscal and monetary policy; income and wealth distribution.

**ECON 603: Microeconomic Analysis II**

(4-1) Cr. 4. S.

*Prereq: ECON 601, ECON 602 and permission of Director of Graduate Education*

General equilibrium analysis, efficiency, and welfare; market failures, externalities, and the theory of the second best; introduction to game theory; adverse selection, signaling, screening and moral hazard.

**ECON 604: Advanced Macroeconomic Analysis**

(4-1) Cr. 4. F.

*Prereq: ECON 601, ECON 602 and permission of Director of Graduate Education*

Topics will be selected from: new Keynesian approaches to business cycle theory; endogenously generated business cycles; models of credit and financial intermediation; mechanism design and time inconsistency issues; political economy models; heterogeneous-agent models with strategic interaction; path dependence, network effects, and lock-in; economies as evolving self-organizing systems.

**ECON 606: Advanced Topics in Macroeconomics**

(3-0) Cr. 3.

*Prereq: ECON 603, and credit or current enrollment in ECON 604*

Selected topics in macroeconomic theory of current significance to the profession.

**ECON 615: Industrial Organization I**

(3-0) Cr. 3.

*Prereq: ECON 603*

Introduction to industrial organization theory and game-theoretic methods. Monopoly and price discrimination. Oligopoly theory and product differentiation. Quality and asymmetric information. Research &amp; development and innovation. Introduction to empirical methods in industrial organization. Discrete choice models of product differentiation. Cost and production functions. Entry, exit, and dynamic equilibrium models.



**ECON 618: Game Theory**

(3-0) Cr. 3.

*Prereq: ECON 603, or ECON 501 and permission of instructor*

Theoretical analysis and applications of strategic games, extensive form games, and cooperative games. Nash equilibrium, correlated equilibrium, Bayesian games, subgame perfect equilibrium, the core, evolutionary equilibrium, repeated games with finite automata, and common knowledge.

**ECON 621: Advanced Labor Demand and Labor Markets**

Cr. 3. S.

*Prereq: ECON 601 or ECON 520*

Analysis of labor demand, job search and matching, unemployment, market determination of wages, compensating differentials, employment contracts and incentives, wage inequality and discrimination, effects of minimum wage legislation, occupation choice, labor unions.

**ECON 641: Agricultural Economics I**

(3-0) Cr. 3.

*Prereq: ECON 603*

Advanced treatment of selected topics and models in agricultural economics, with policy analysis applications. Topics include: farm-level input and output choices; decision making under uncertainty; supply analysis, storage and commodity markets; risk management and hedging; crop insurance; credit markets; farmland prices; market integration.

**ECON 642: Agricultural Economics II**

(3-0) Cr. 3.

*Prereq: ECON 603*

Advanced treatment of selected topics and models in agricultural economics, with policy analysis applications. Topics include: demand systems for food and agricultural goods; imperfect competition and market power in agriculture; contracts; economics of R&D and innovation; quality and product differentiation; equilibrium models for agricultural policy analysis.

**ECON 653: Financial Economics**

(3-0) Cr. 3.

*Prereq: ECON 603, ECON 672. Recommended: ECON 674, STAT 551*

Review of decision-making under uncertainty. Portfolio Theory. Theoretical foundations of asset valuation models: capital asset pricing model (CAPM), arbitrage pricing theory (APT), representative agent models, pricing of derivative securities. Complete and incomplete asset markets, credit markets, financial intermediaries, the role of government in the financial sector. Market frictions, crashes, bubbles. Applications of asset valuation models, with emphasis on their testable implications.

**ECON 655: International Trade**

(3-0) Cr. 3.

*Prereq: ECON 603*

Theories of international trade; welfare and distributional aspects of trade and commercial policies. Optimal trade policies in the presence of domestic distortions; strategic trade policy; international trade and economic growth.

**ECON 657: International Finance**

(3-0) Cr. 3.

*Prereq: ECON 602*

The intertemporal approach to current account determination; non-traded goods and the real exchange rate; fiscal policy in the open economy; monetary approach to balance of payments and exchange rate determination; sticky price models of the open economy; exchange-rate based stabilizations; capital inflows; financial and balance of payments crises; international business cycles.

**ECON 671: Econometrics I**

(4-1) Cr. 4. F.

*Prereq: ECON 501 and STAT 447 or STAT 542*

Probability and distribution theory for univariate and multivariate normal random variables, introduction to the theory of estimators for linear models, hypothesis testing and inference, introduction to large sample properties of estimators; derivation of common estimators and their properties for the classical and general multiple regression models, hypothesis testing, forecasting, implications of specification errors - missing data, left-out regressors, measurement error, stochastic regressors.

**ECON 672: Econometrics II**

(4-1) Cr. 4. S.

*Prereq: ECON 671*

Identification, estimation, and evaluation of systems of simultaneous equations; qualitative choice and limited dependent variable models; introduction to time series methods and applications, including alternative variance specifications.

**ECON 673: Microeconometrics**

(3-0) Cr. 3.

*Prereq: ECON 672, ECON 601*

Econometric treatment of models arising in microeconomic applications. Methods are primarily concerned with the analysis of cross-section data. Topics may include: systems of demand equations in panel data settings, random utility models of discrete choices, production possibilities frontier estimation, and discrete/continuous models of participation and consumption.

**ECON 674: Macroeconometrics**

(3-0) Cr. 3.

*Prereq: ECON 672, ECON 602*

Time-series econometric techniques and their application to macroeconomics and financial markets. Techniques may include GARCH and ARCH-M models, unit-root tests, nonlinear adjustment models, structural VARs, and cointegration tests.

**ECON 680: Advanced Resource Economics**

(3-0) Cr. 3.

*Prereq: ECON 603*

Dynamic allocation of scarce, exhaustible, and renewable natural resources, including minerals and energy, soil, water, forests, and fish. Social versus private decisions. Market and nonmarket considerations. Technological change. Regulation. Dynamics and uncertainty.

**ECON 690: Advanced Topics**

Cr. 1-5. Repeatable.

Offered on a satisfactory-fail basis only.

**ECON 694A: Research Workshop**

Cr. 3. F.

*Prereq: Third year status in the Economics Ph.D. program or permission of instructor.*

Instruction in basic and applied research methods commonly used in economics. Survey methodologies, critique written work, summarize and evaluate data, prepare and present work orally, and develop an original research paper. Satisfactory-fail only. Offered on a satisfactory-fail basis only.

**ECON 694B: Research Workshop**

Cr. 3. S.

*Prereq: Econ 694A*

Writing and communicating economic research. Continuation of Econ 694A, resulting in completion of an original research paper. Satisfactory-fail only. Offered on a satisfactory-fail basis only.

**ECON 699: Research for Thesis or Dissertation**

Cr. arr. Repeatable.

Offered on a satisfactory-fail basis only.

## Education (EDUC)

***Any experimental courses offered by EDUC can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****EDUC 201: Educational Technologies in the PK-6 Classroom**

(2-2) Cr. 3. F.S.

Overview of ways to use educational technologies to support instruction in PK-6 settings. Focus on pedagogical approaches that integrate technologies to support learning in the content areas. Laboratory experiences include development of activities to use web 2.0 tools, apps, multimedia, web page development, digital video and other technologies to facilitate learning and teaching.

**EDUC 202: Educational Technologies in the 7-12 Classroom**

Cr. 3. F.S.

Overview of ways to use educational technologies to support instruction in 7-12 settings. Focus on pedagogical approaches that integrate technologies to support learning in the content areas. Laboratory experiences include development of activities to use tool software, multimedia, web page development, digital video and other technologies to facilitate learning and teaching.

**EDUC 204: Social Foundations of Education in the United States: Secondary**

(3-0) Cr. 3. F.S.SS.

Introduction to the historical and contemporary landscape of schooling in the United States. Emphasis is placed on topics and tensions in the relationship between school and society (e.g. equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching and learning at the secondary level in public schools. For prospective teachers in an ISU Secondary Educator Preparation program; open to students who are considering teaching and/or work in education as a career path.

**EDUC 205: Social Foundations of Education in the United States: Early Childhood and Elementary Education**

Cr. 3. F.S.

Introduction to the historical and contemporary landscape of schooling in the United States. Emphasis on topics and tensions in the relationship between school and society (e.g., equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching and learning in public schools. Students in K-12 education, secondary, education, or a non-education major should take EDUC 204.

**EDUC 216: Learning Community Orientation to Teacher Education**

(1-0) Cr. 1. F.

*Prereq: All first semester freshman Elementary Education majors are automatically enrolled.*

Learning Community for Elementary Education majors to help with their transition to university life. Offers an overview of K-8 teacher certification in Iowa as well as degree and career planning. With the help of guest speakers and peer mentors, students learn about elementary teaching as a profession and are introduced to a social justice orientation to teaching. Offered on a satisfactory-fail basis only.

**EDUC 219: Orientation to Teacher Education: FCS, History, Math, Science and World Language and Cultures Majors**

Cr. 1. F.S.

*Prereq: Students seeking teacher licensure in Family and Consumer Sciences, History, Mathematics, Science and World Language and Cultures in grades 5-12.*

Overview of mathematics, science, family and consumer sciences and history, and world language and cultures secondary education (grades 5-12), teacher licensure requirements in Iowa and other states. Program and career planning. Offered on a satisfactory-fail basis only.

**EDUC 245: Landscape of Teaching**

(3-0) Cr. 3. F.S.

*Prereq: EDUC 205; sophomore classification.*

Introduction to the landscape of teaching including the exploration of outside influences that impact schools, classroom structures (including classroom management systems) that help classrooms function efficiently and effectively, and instructional planning (basic lesson design and assessment) that addresses state standards and students' needs. Open to students majoring in Elementary Education or Early Childhood Education.

**EDUC 275: International Travel Study - Pre-departure Orientation**

Cr. 1. Repeatable, maximum of 2 times. S.

*Prereq: Instructor permission required: Participants required to be accepted to international travel study program.*

Orientation to the international travel study, offered during the semester preceding the trip.

**EDUC 280: Pre-Student Teaching Experience I**

(1-8) Cr. 0.5-2. Repeatable. F.S.

Pre-Student teaching experience in school settings. One, half day per week needed for school experience. Clinical Experience Level. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280A: Pre-Student Teaching Experience**

(1-8) Cr. 1-2. Repeatable. F.S.

*Prereq: Admitted to the Educator Preparation Program*

Pre-Student teaching experience in school settings. Two, half days per week needed for school experience. Clinical Experience Level 2 or 3. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280B: Pre-Student Teaching Experience I: Educational Technologies**

(1-8) Cr. 1. F.S.

*Prereq: EDUC 201 or EDUC 203*

Pre-Student teaching experience with technologies in various educational settings with K-12 technology leaders. 2 1/2-hour blocks of time needed. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280I: Pre-Student Teaching Experience I: Mild/Moderate Disabilities**

(1-8) Cr. 1. Repeatable. S.

Pre-Student teaching experience in mild/moderate disabilities in school settings. One, half-day per week needed for school experience. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280J: Pre-Student Teaching Experience I: Mathematics Clinic**

Cr. 1. Repeatable. S.

Early field experience where students explore and develop an understanding of research-based instructional practices that could be implemented with middle level students to teach mathematical concepts. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280K: Pre-Student Teaching Experience I: Music**

(Cross-listed with MUSIC). Cr. 0.5. Repeatable. S.

Pre-student teaching experience in music in school settings. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280L: Pre-Student Teaching Experience I: Secondary Education**

Cr. 0.5. Repeatable. F.S.

Pre-student teaching experience for secondary education students in school settings. One, half-day per week needed for school experience. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280N: Pre-Student Teaching Experience I: Elementary Education**

(1-8) Cr. 0.5-1. Repeatable. S.

Pre-student teaching experience for students in school settings. One, half-day per week needed for school experience. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280O: Pre-Student Teaching Experience 1: Art Education**

(1-8) Cr. 1. Repeatable. F.S.

Pre-student teaching experience in art education in school settings. 2 1/2-hour blocks of time needed. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280S: Pre-Student Teaching Experience I: English as a Second Language (ESL)**

(0-4) Cr. 1. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to the Educator Preparation Program*

Pre-student teaching experience in English as a Second Language. One, half-day per week needed for school experience. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**EDUC 280T: Pre-Student Teaching Experience I: Tutoring**

Cr. 1. Repeatable. F.S.

Pre-student teaching experience tutoring in a school setting focused on mathematics, literacy, and/or other content areas. Clinical Experience Level 1. Offered on a satisfactory-fail basis only.

**EDUC 290: Independent Study**

Cr. 1-3.

*Prereq: 6 credits in Education, permission of department chair*

Independent study, under faculty supervision, of a topic in the field of education.

**EDUC 302: Principles and Practices of Learning with Technology**

Cr. 3. S.

*Prereq: EDUC 201 or EDUC 203*

Advanced integration of learning technologies into PK-12 educational contexts. Examine current trends in using learning technologies with PK-12 students; explore current applications used in formal and informal educational settings; and discuss issues focused on technology use in education. Required for Learning Technologies Minor.

**EDUC 315: Transfer Orientation**

Cr. 1. F.S.

Offers an overview of Elementary Education requirements, university procedures, K-8 certification in Iowa as well as degree and career planning. With the help of guest speakers and peer mentors, students learn about elementary teaching as a profession and are introduced to a social justice orientation to teaching. Learning community required of all transfer students and change of major students pursuing Elementary Education. Offered on a satisfactory-fail basis only.

**EDUC 332: Educational Psychology of Early Childhood and Elementary Education**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 230 or HD FS 102, open only to majors in Early Childhood Education or Elementary Education*

Psychological theories relevant to student development, learning, and motivation. Review of assessment principles and practices. Implications of theory for teaching children and for assessing learning in educational settings with primary and intermediate grade children.

**EDUC 333: Educational Psychology**

(Cross-listed with PSYCH). (3-0) Cr. 3. F.S.

*Prereq: PSYCH 230 or HD FS 102, pursuing educator preparation or major in psychology*

Psychological theories relevant to student development, learning, and motivation. Review of assessment principles and practices. Implications of theory for teaching children and for assessing learning in K-12 educational settings, with an emphasis on grades 5 – 12.

**EDUC 347: Nature of Science**

(Dual-listed with EDUC 547). (3-0) Cr. 3.

*Prereq: Admitted to the Educator Preparation Program (Secondary Science Education) or permission of instructor*

The history, philosophy, and sociology of science, how scientific knowledge differs from other forms of knowledge, and the relationship of the Nature of Science to science teaching and learning.

**EDUC 370: Toying with Technology**

Cr. 3. F.S.

*Prereq: EDUC 201 or EDUC 203*

Integration of learning technologies into PK-12 STEM contexts with a focus on engineering design and computational thinking. Examine current trends and explore how technology can be used to design creative and innovative hands-on experiences that promote computational thinking and problem-solving skills across STEM-related educational contexts.

**EDUC 377: Teaching Literacy in the Primary Grades**

(4-0) Cr. 4. F.S.SS.

*Prereq: Admitted to the Educator Preparation Program, EDUC 245, SP ED 250, HD FS 240 (ECE majors); concurrent enrollment in EDUC 405, EDUC 448, EDUC 468A, and EDUC 468C (EL ED majors) or EDUC 438, EDUC 468F, EDUC 468G, SP ED 458.*

Theories, teaching strategies, and instructional materials pertinent to teaching reading, writing, listening, and speaking to children in kindergarten through third grade.

**EDUC 378: Teaching Literacy in the Intermediate Grades**

(4-0) Cr. 4. F.S.SS.

*Prereq: EDUC 377; concurrent enrollment in EDUC 449, EDUC 468B, EDUC 468D, and EDUC 443; admitted to the Educator Preparation Program*

Theories and processes of literacy. Application through reading and writing across the curriculum, integration of language arts, literature-based instruction, and metacognitive strategies.

**EDUC 380: Pre-Student Teaching Experience II**

(1-8) Cr. 1-2. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program*

Participation in a school setting. (S/F grading may be used in some offerings of some sections.). Offered on a satisfactory-fail basis only.

**EDUC 380A: Pre-Student Teaching Experience II: Core Experience**

(1-8) Cr. 1-2. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program*

Pre-Student teaching experience in school setting. Two, half-days per week needed for school experience. Clinical Experience Level 2. Offered on a satisfactory-fail basis only.

**EDUC 380B: Pre-Student Teaching Experience II: Physical Science, Chemistry or Physics**

(1-8) Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program.*

Pre-student teaching experience in physical science, chemistry, or physics. Two, half-days per week needed for school experience. Clinical Experience Level 2. Offered on a satisfactory-fail basis only. EDUC 380 may be taken more than once for credit toward graduation.

**EDUC 380D: Pre-Student Teaching Experience II: Biological Sciences**

(1-8) Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program.*

Pre-student teaching experience in physical science, chemistry, or physics. Two, half-days per week needed for school experience. Clinical Experience Level 2. Offered on a satisfactory-fail basis only. EDUC 380 may be taken more than once for credit toward graduation.

**EDUC 380J: Pre-Student Teaching Experience II: Earth Sciences**

(1-8) Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program.*

Pre-student teaching experience in earth science. Two, half-days per week needed for school experience. Clinical Experience Level 2. Offered on a satisfactory-fail basis only. EDUC 380 may be taken more than once for credit toward graduation.

**EDUC 380K: Pre-Student Teaching Experience II: Music**

(Cross-listed with MUSIC). (1-8) Cr. 1-2.

*Prereq: Admission to Educator Preparation Program*

Participation in a K-12 school setting. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 2. Offered on a satisfactory-fail basis only.

**EDUC 380S: Pre-Student Teaching Experience II: English as a Second Language (ESL)**

(0-4) Cr. 1. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program.*

Pre-student teaching experience in English as a Second Language. One, half-day per week needed for school experience. Clinical Experience Level 2. Offered on a satisfactory-fail basis only. EDUC 380 may be taken more than once for credit toward graduation.

**EDUC 380V: Pre-Student Teaching Experience in FCS Education: Practicum in FCS Labs**

(Cross-listed with FCEDS). (0-2) Cr. 1-2. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; Admission to Educator Preparation program*

Laboratory experience in foods, hospitality management, culinary, prostart, textiles, fashion design, housing, and human development related to family and consumer sciences courses taught at the secondary level. Planning, implementing, managing, and assessing laboratory lessons in family and consumer sciences. Includes 24 hours practicum: unsupervised. 1/2 day of time needed in schedule. Offered on a satisfactory-fail basis only.

**EDUC 395: Teaching Disciplinary Literacy**

(Dual-listed with EDUC 595). (3-0) Cr. 3. F.S.SS.

Analysis and application of strategies to enhance students' disciplinary literacy development in middle and secondary school setting. Research paper related to a course topic for EDUC 595.

### **EDUC 405: Social Justice Education and Teaching: Early Childhood and Elementary**

Cr. 3. F.S.

*Prereq: EDUC 201, EDUC 332, junior classification, Admitted to the Educator Preparation Program: concurrent enrollment in EDUC 377, 448, 468A 468C*

Awareness and nature of social justice in relation to the educational system; deep exploration of justice in education at the levels of self, teaching, and systems; multicultural concepts and theories; awareness of context of cultural groups -their history, perspective, needs, and contributions; problems and issues regarding prejudice, discrimination, and oppression based on race, ethnicity, socioeconomic class, gender, sexual identity and language in the school environment. Special attention is given to enacting culturally relevant teaching in grades PK through 6, along with curriculum transformation and social action in those grades. Restricted to those enrolled in Early Childhood and Elementary Education Programs.

Meets U.S. Diversity Requirement

### **EDUC 406: Social Justice Education and Teaching: Secondary (3-0) Cr. 3. F.S.SS.**

*Prereq: EDUC 201 or EDUC 203, (or KIN 312 or KIN 471 for PETE candidates), EDUC 332 or EDUC 333, junior classification, admitted to the Educator Preparation Program. Restricted to those enrolled in Secondary and K-12 Education Programs.*

Awareness and nature of social justice in relation to the educational system; need for cultural competence; multicultural concepts and theories; awareness of context of cultural groups - their history, perspective, needs, and contributions; problems and issues regarding prejudice, and discrimination based on race, ethnicity, socioeconomic class, gender, sexual identity and language in the school environment. Special attention to culturally relevant teaching in grades 7 through 12, along with curriculum transformation and social action in those grades. Meets U.S. Diversity Requirement

### **EDUC 407: Online Education in Pre-K-12 Classrooms: Hybrid, Virtual, and Blended Approaches**

(3-0) Cr. 3. F.SS.

*Prereq: EDUC 201 or EDUC 203.*

Preparing educators to develop and sustain learning environments where their students are physically separated from them. Developing flexible and distance learning experiences where Pre- K-12 students expand their knowledge and improve their skills in curricular areas outside of the traditional classroom. Required for the Learning Technologies Minor.

### **EDUC 416: Supervised Student Teaching - Elementary**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; admitted to Educator Preparation Program; senior classification; successful completion of all methods courses*  
Supervised teaching experience in the elementary grades.

### **EDUC 416A: Supervised Student Teaching - Elementary: Primary grades (K-3)**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; admitted to Educator Preparation Program; senior classification; successful completion of all methods courses*  
Supervised teaching experience in the elementary grades.

### **EDUC 416B: Supervised Student Teaching - Elementary: Intermediate grades (3-6)**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; admitted to Educator Preparation Program; senior classification; successful completion of all methods courses*  
Supervised teaching experience in the elementary grades.

### **EDUC 416D: Supervised Student Teaching - Elementary: International Student Teaching - Primary Grades**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; admitted to Educator Preparation Program; senior classification; successful completion of all methods courses*  
Supervised teaching experience in the elementary grades.

### **EDUC 416E: Supervised Student Teaching - Elementary: International Student Teaching - Intermediate Grades**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; admitted to Educator Preparation Program; senior classification; successful completion of all methods courses*  
Supervised teaching experience in the elementary grades.

### **EDUC 416Z: Supervised Student Teaching - Elementary: English as a Second Language**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program; senior classification; ENGL 219; ENGL 220; ENGL 425; EDUC 280S; EDUC 480S*  
Supervised teaching experience in the elementary grades.

### **EDUC 417: Student Teaching**

(Dual-listed with EDUC 517). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program or licensed teacher; approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching.

### **EDUC 417A: Student Teaching: Social Studies-Middle School**

(Dual-listed with EDUC 517A). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.



**EDUC 417B: Student Teaching: Physical Sciences, Chemistry or Physics**

(Dual-listed with EDUC 517B). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in physical sciences grades 5-12.

**EDUC 417C: Student Teaching: Mathematics**

(Dual-listed with EDUC 517C). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in mathematics grades 5-12.

**EDUC 417D: Student Teaching: Biological Sciences**

(Dual-listed with EDUC 517D). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in biological sciences grades 5-12.

**EDUC 417F: Student Teaching: Speech**

Cr. arr. Repeatable.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching.*

Evaluation of instruction, lesson planning, and teaching in speech.

**EDUC 417G: Student Teaching: World Language**

(Dual-listed with EDUC 517G). (Cross-listed with WLC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**EDUC 417J: Student Teaching: Earth Sciences**

(Dual-listed with EDUC 517J). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in earth sciences grades 5-12.

**EDUC 417M: Student Teaching: Science - Basic**

(Dual-listed with EDUC 517M). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in basic sciences grades 5-12.

**EDUC 417N: Student Teaching: International**

(Dual-listed with EDUC 517N). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 417P: Student Teaching: Social Studies-High School**

(Dual-listed with EDUC 517P). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 417R: Student Teaching: Music-Elementary**

(Dual-listed with EDUC 517R). (Cross-listed with MUSIC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 417S: Student Teaching: Music-Secondary**

(Dual-listed with EDUC 517S). (Cross-listed with MUSIC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program; approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 417Z: Supervised Student Teaching- Secondary: English as Second Language**

Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching.*

Evaluation of instruction, lesson planning, and teaching in English as a Second Language grades 7-12.

**EDUC 418: Secondary Science Methods I**

(Dual-listed with EDUC 518). (3-0) Cr. 3. F.

*Prereq: EDUC 280L or EDUC 514; undergraduate students must register concurrently for EDUC 280A; graduate students must register concurrently for EDUC 591D. Admitted to the Educator Preparation Program.*

Develop an understanding of research-based practices for effective and equitable science teaching that align with state and national standards. Emphasis is on the character and role of science inquiry, teaching behaviors and strategies, and actively engaging students in self-evaluation and evidence-based inquiry learning experiences.

**EDUC 419: Secondary Science Methods II**

(Dual-listed with EDUC 519). (3-0) Cr. 3. S.

*Prereq: EDUC 418 or EDUC 518, undergraduate students must register concurrently for EDUC 480B, 480D, or 480J; graduate students must register concurrently for EDUC 517B, 517D, 517J or 517P.*

Advancing a research-based framework for effective and equitable science teaching rooted in the idea that students need opportunities to make sense of phenomena, and grapple with scientific ideas using authentic science and engineering practices while observing science safety.

**EDUC 420: Bilingualism & The Education of Latinx Youth**

(Dual-listed with EDUC 520). (Cross-listed with US LS). (3-0) Cr. 3. F.

*Prereq: EDUC 405 or EDUC 406*

Introduction to research on bilingualism and examination of the social, historical, and political contexts of Spanish/English education in the U.S. Attention to policy environment, school program structure, mode of classroom instruction, family and community context, and attainment of bilingualism and biculturalism for Latinx youth.

Meets U.S. Diversity Requirement

**EDUC 422: Teaching and Learning Iowa History**

(Dual-listed with EDUC 522). Cr. 3. SS.

Multicultural and social justice focus on Iowa history; different theme each summer. Effective pedagogical and assessment strategies for integrating these themes into K-12 curriculum.

**EDUC 426: Principles of Secondary Education**

(Dual-listed with EDUC 526). (3-0) Cr. 3. F.S.SS.

*Prereq: Senior classification and admitted to Educator Preparation Program*

Introduction to secondary education teaching strategies, lesson planning that provides equitable learning opportunities for all students, classroom management, legal aspects of schools, professional and ethical issues, current educational issues, professional learning communities, and social-justice oriented teaching.

**EDUC 433: Teaching Social Studies in the Primary Grades**

(2-0) Cr. 2. F.S.

*Prereq: EDUC 377, HD FS 224; concurrent enrollment in EDUC 439, SP ED 405, SP ED 458, and EDUC 468I ; Admitted to Educator Preparation Program*

Emphasis is placed on providing equity and justice-oriented social studies learning experiences (e.g. curriculum content, instructional strategies, and assessment) for primary grade children.

**EDUC 438: Teaching Mathematics in the Primary Grades**

(2-0) Cr. 2. F.S.

*Prereq: MATH 195 (minimum grade of C-), MATH 196 (minimum grade of C-); concurrent enrollment in EDUC 377, EDUC 468F, EDUC 468G. Admitted to the Educator Preparation Program.*

Develop an understanding of effective mathematics teaching practices situated in equitable pedagogies that support primary students' mathematical understanding.

**EDUC 439: Teaching Science in the Primary Grades**

(2-0) Cr. 2. F.S.

*Prereq: EDUC 377, HD FS 224; concurrent enrollment in EDUC 433, EDUC 468I, SP ED 405. Admitted to the Educator Preparation Program.*

Development and application of effective methods of science teaching that align with standards and best practices. Emphasis is on research-based, equitable teaching practices that provide appropriate science learning experiences in the early elementary grades.

**EDUC 443: The Teaching of Social Studies**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDUC 377, concurrent enrollment in EDUC 378, EDUC 449, EDUC 468B and EDUC 468D; Admitted to the Educator Preparation Program.*

Emphasis is placed on providing equity and justice-oriented social studies learning experiences (e.g. curriculum content, instructional strategies, and assessment) for primary and intermediate grade children.

**EDUC 448: Teaching Children Mathematics**

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 195 (minimum grade of C-), MATH 196 (minimum grade of C-); concurrent enrollment in EDUC 377, EDUC 468A, EDUC 468C, and EDUC 405; admitted to Educator Preparation Program*

Develop an understanding of effective mathematics teaching practices situated in equitable pedagogies that support elementary students' mathematical understanding.

**EDUC 449: The Teaching of Science**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDUC 377, concurrent enrollment in EDUC 378, EDUC 468B, EDUC 468D and EDUC 443. Admitted to the Educator Preparation Program.*

Development and application of effective methods of science teaching that align with standards and best practices. Emphasis is on research-based, equitable teaching practices that provide appropriate science learning experiences in the elementary grades.

**EDUC 450: Ethnicity and Learning**

(Dual-listed with EDUC 550). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: EDUC 332 or EDUC 333; EDUC 406*

Examination of cultural relevance in education. Development and application of strategies and techniques for implementing multicultural goals and multiethnic perspectives in PreK-12 school classroom settings.

**EDUC 452: Assessment for Literacy and Learning**

(Dual-listed with EDUC 552). (3-0) Cr. 3. F.S.SS.

*Prereq: EDUC 378 or equivalent. Concurrent enrollment in EDUC 488.*

Identification, analysis and correction of reading problems in five areas: print knowledge, integration of print knowledge, oral reading fluency, vocabulary, and comprehension.

**EDUC 454: Emerging Topics in Educational Technologies**

Cr. 1. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: EDUC 201 or EDUC 203*

Development and application of emerging technology topics related to digital learning. Series of 1 credit on-line learning modules on current technology being used in education and topics being addressed.

These modules extend learning opportunities from other courses and experiences. Required for Learning Technologies Minor.

**EDUC 456: Integrating Technology into Literacy**

(Dual-listed with EDUC 556). (3-0) Cr. 3. F.SS.

*Prereq: EDUC 201 or EDUC 203; EDUC 377*

Methods and strategies used to integrate technology into K-8 literacy. Examination of the use and evaluation of technology appropriate for elementary literacy classrooms.

**EDUC 459: Critical Approaches to Teaching Children's and Adolescent Literature**

(Dual-listed with EDUC 559). (3-0) Cr. 3. F.S.SS.

*Prereq: Admitted to Educator Preparation Program; EDUC 377 and EDUC 378.*

Research and discussion of issues surrounding the classroom use of literature for children and young adults including censorship, diversity, selection, critical literacy and the influences of technology.

Meets U.S. Diversity Requirement

**EDUC 468: Pre-Student Teaching Experience III**

Cr. 1-2. F.S.SS.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods, and instructional experiences with children in a supervised elementary, middle, or high school classroom while engaged in other methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468A: Pre-Student Teaching Experience III: Primary Grades, Reading and Language Arts**

Cr. 1. F.S.SS.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised K-3 elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468B: Pre-Student Teaching Experience III: Intermediate Grades, Reading and Language Arts**

Cr. 1. F.S.SS.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised 3-6 elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468C: Pre-Student Teaching Experience III: Primary Grades, Mathematics**

Cr. 1. F.S.SS.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods, and instructional experiences with children in a supervised K-3 elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468D: Pre-Student Teaching Experience III: Intermediate Grades, Science**

Cr. 1. F.S.SS.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised 3-6 elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468F: Pre-Student Teaching Experience III: Primary Grades Inclusive, Literacy**

Cr. 1. F.S.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised K-3 inclusive elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468G: Pre-Student Teaching Experience III: Primary Grades Inclusive, Mathematics**

Cr. 1. F.S.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised K-3 inclusive elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468I: Pre-Student Teaching Experience III: Primary Grades Inclusive, Science**

Cr. 1. F.S.

*Prereq: Admitted to Educator Preparation Program*

Application of current methods and instructional experiences with children in a supervised K-3 inclusive elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468R: Pre-Student Teaching Experience II: Intermediate Grades, Reading Endorsement**

Cr. 1. F.S.SS.

*Prereq: Admitted to Educator Preparation Program; concurrent enrollment in EDUC 378*

Application of current methods and instructional experiences with children in a supervised 3-6 elementary classroom while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 468T: Pre-Student Teaching Experience III: Elementary**

Cr. 2. Repeatable, maximum of 4 credits. F.S.

*Prereq: Admitted to Educator Preparation Program, successful completion of a Level 2 or Level 3 field experience required.*

Application of current methods and instructional experiences with children in a supervised elementary classroom outside of Iowa while engaged in other elementary methods courses. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 475: International Travel Study in Education**

(Dual-listed with EDUC 575). Cr. 1-6. Repeatable, maximum of 3 times. SS.

*Prereq: EDUC 275 Program leader should have accepted participating students to the international travel study. Students enrolled in EDUC 575 (graduate level) must have completed 6 graduate credits to be eligible for the course.*

Seminar-based course for undergraduate and graduate students to develop a better understanding around global issues related to teaching, learning, curriculum, and educational policy through international travel study. 1 to 6 week duration involving study in a country other than the US.

**EDUC 480: Pre-Student Teaching Experience III**

Cr. 0.5-2. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program*

Observation and participation in a variety of school settings after admission to the teacher education program. Permission of area coordinator required prior to enrollment. (S/F grading may be used in some offerings of some sections.).

**EDUC 480A: Pre-Student Teaching Experience III: History/Social Sciences**

(Cross-listed with HIST). Cr. 2. Repeatable, maximum of 2 times. F.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of History/Social Sciences coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Supervision Level 3.

**EDUC 480B: Pre-Student Teaching Experience III: Physical Science, Chemistry, or Physics**

Cr. 2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of program coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Supervision Level 3.

**EDUC 480C: Pre-Student Teaching Experience III: Mathematics**

Cr. 0.5-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation mathematics in a 5-12 school setting. Permission of mathematics coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Experience Level 3.

**EDUC 480D: Pre-Student Teaching Experience III: Biological Sciences**

Cr. 2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of program coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Supervision Level 3.

**EDUC 480E: Pre-Student Teaching Experience III: English**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of English coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Experience Level 3.

**EDUC 480G: Pre-Student Teaching Experience III: World Languages and Cultures**

Cr. 1-2. Repeatable, maximum of 2 times. F.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of World Languages and Cultures coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Experience Level 3.

**EDUC 480J: Pre-Student Teaching Experience III: Earth Science**

Cr. 2. Repeatable, maximum of 2 times. F.S.

*Prereq: Admitted to the Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of program coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Supervision Level 3.

**EDUC 480K: Pre-Student Teaching Experience III: Music**

(Cross-listed with MUSIC). Cr. 1-2. Repeatable. F.S.

*Prereq: Admission to Educator Preparation Program*

Participation in a K-12 school setting. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 480S: Pre-Student Teaching Experience III: English as a Second Language (ESL)**

(0-4) Cr. 2. Repeatable, maximum of 2 times.

*Prereq: EDUC 280S, ENGL 219/LING 219; ENGL 220/LING 220; Admitted to Educator Preparation Program*

Supervised participation in a school setting. Permission of ESL area coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical experience level 3. Offered on a satisfactory-fail basis only.

**EDUC 480T: Pre-Student Teaching Experience III: Secondary Education**

Cr. 2. Repeatable, maximum of 4 credits. F.S.

*Prereq: Admitted to Educator Preparation Program, successful completion of a Level 2 or Level 3 field experience.*

Supervised participation in a 5-12 school setting outside of Iowa. Permission of content program coordinator required prior to enrollment. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**EDUC 480V: Pre-Student Teaching Experience in FCS Education: Practicum in Diverse Settings**

(Cross-listed with FCEDS). (0-4) Cr. 2. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; FCEDS 380V; admission to Educator Preparation program*

Laboratory experience in foods, textiles, and human development related to family and consumer sciences exploratory programs. Planning, implementing, managing and assessing laboratory lessons in family and consumer sciences. Includes 48 hours practicum and supervised individual teaching. 1/2 day of time needed in schedule. Offered on a satisfactory-fail basis only.

**EDUC 481: Philosophy of Education**

(Dual-listed with EDUC 581). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to philosophy of education. Emphasis is placed on historical and contemporary debates about the nature and purposes(s) of education in a just society. Possible topics include questions such as: When is one justified in claiming to know or to have learned? Who is morally responsible for a learner's education or schooling? What is a just distribution of educational opportunities? How might one teach philosophically?.

**EDUC 486: Methods in Elementary School World Language Instruction**

(Cross-listed with LING, WLC). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language*

Planning, implementation, and assessment of standards-based, student-centered, and thematic instruction in the elementary (K-8) classroom. Special emphasis on K-8 students' communicative skills, cultural knowledge, and content learning.

**EDUC 487: Methods in Secondary School World Language Instruction**

(Cross-listed with LING, WLC). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language; Department Permission*

Theories and principles of contemporary world language learning and teaching. Special emphasis on designing instruction and assessments for active learning. Admission to teacher education required.

**EDUC 488: Supervised Tutoring in Reading**

(Dual-listed with EDUC 588). (2-2) Cr. 3. F.S.SS.

*Prereq: EDUC 488: EDUC 378 or equivalent; concurrent enrollment in EDUC 452. EDUC 588: Graduate status; concurrent enrollment in EDUC 552.*

Using formal and informal diagnostic procedures to plan and implement individualized reading instruction. Field experience in tutoring and a related research project.

**EDUC 490: Independent Study**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490A: Independent Study: Education**

(Cross-listed with MUSIC). Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent Study in Music.

**EDUC 490C: Independent Study: Curriculum Construction**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490D: Independent Study: Principles of Education**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490E: Independent Study: Methods of Teaching**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490F: Independent Study: Educational Psychology**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490G: Independent Study: Digital Learning**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490H: Independent Study: Honors**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490J: Independent Study: Social and Cultural Studies**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490K: Independent Study: History/Social Sciences**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490L: Independent Study: Literacy Education**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490M: Independent Study: Mathematics Education**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490N: Independent Study: World Language**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490O: Independent Study: Foundations of Education**

Cr. 1-3. F.S.SS.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 490P: Independent Study: Science Education**

Cr. 1-3. F.S.

*Prereq: GPA of 2.5 or more for preceding semester*

**EDUC 495B: Independent Study: Teaching Speech**

(Cross-listed with SP CM). (3-0) Cr. 3. F.

*Prereq: 9 credits in SP CM; minimum GPA of 2.5 in SP CM courses*

Problems, methods, and materials related to teaching speech, theatre, and media in secondary schools.

**EDUC 497: Teaching Secondary School Mathematics**

(Cross-listed with MATH). (3-0) Cr. 3. F.

*Prereq: 15 credits in college mathematics. Admitted to the Educator Preparation Program.*

Develop an understanding of instructional planning, lesson implementation, and assessment in grades 5-12 mathematics, with a focus on reform-based mathematics, equity, and conceptual understanding.

**EDUC 498: Methods of Teaching History/Social Sciences**

(Cross-listed with HIST). (3-0) Cr. 3. F.S.

*Prereq: Concurrent enrollment in HIST 480A; admission to Educator Preparation Program*

Theories and processes of teaching and learning secondary history/social sciences. Emphasis on development and enactment of current methods, assessments, and curriculum materials for providing appropriate learning experiences.

**Courses primarily for graduate students, open to qualified undergraduates:**

**EDUC 501: Foundations of Educational Technology**

(3-0) Cr. 3. F.SS.

*Prereq: Graduate classification*

Educational philosophies and theories of teaching, learning, and technologies. Understanding of how people learn with, and through, educational technology, in many settings. Overview of significant topics in educational technology. Major learning theories, including recent debates in how educators conceive of learning; teaching and learning with technology; new literacies practices; and critical theory.



**EDUC 502: Teaching Mathematics to English Language Learners**

(Cr. 3. S.SS.)

*Prereq:* EDUC 448 or EDUC 497/EDUC 597 for degree students. Classroom teaching experience for non-degree students and in-service teachers

Understanding the needs of various English language learners, learn to use ELLs' language and culture as a resource in mathematics classrooms, and implement research-based instructional strategies that are effective to teach mathematics for ELLs. For pre-service/in-service teachers and others who will work or currently works with English language learners (ELLs).

**EDUC 503: Designing Effective Learning Environments**

(3-0) Cr. 3. F.

*Prereq:* EDUC 501

Application of theories and models of instructional design. Design decision-making based on the analysis of performance problems and instructional inputs. Practical experience with the design and development of instruction and evaluation principles.

**EDUC 504: Evaluating Technology-based Learning Environments**

(Cross-listed with HCI). (3-0) Cr. 3. S.

*Prereq:* EDUC 501

Principles and procedures to plan, design, and conduct effective evaluation studies (formative, summative, usability) in different settings are studied. Opportunities to engage in real or simulated evaluation projects of substantial scope are provided. Create evaluation instruments, develop methods with which to evaluate a product or program, conduct try-outs or usability sessions, analyze the data, report the findings, and recommendations are some of the course activities.

**EDUC 505: Using Technology in Learning and Teaching**

(3-0) Cr. 3. F.S.

*Prereq:* Graduate classification

Teaching and learning using educational technology. Selection and evaluation of digital tools for teaching and learning. Research on instructional technology. Tool software. Trends in computer-based instruction.

**EDUC 506: Social Justice Education and Teaching: Advanced**

(3-0) Cr. 3. F.SS.

Engage with justice-oriented multicultural frameworks for transformative education and education research, understand equity in education in historical and contemporary contexts, develop principled approaches to critical self-reflection, interpret educational situations in justice-oriented ways, and counter inequities in education through curriculum, pedagogy, and research.

**EDUC 508: Algebra in the K-12 Classrooms**

(3-0) Cr. 3. F.

*Prereq:* 6 credits of mathematics; credit or concurrent enrollment in EDUC 448 or EDUC 497 or EDUC 597

Focus on Algebraic reasoning, concepts, and associated procedures in K-12 classrooms, especially middle level. Using algebra and algebraic reasoning to solve a real-life problem. Attention is given to algebraic habits of mind, generalization, representation, and transition from arithmetic algorithms to algebra.

**EDUC 509: Geometry in the K-12 Classrooms**

(3-0) Cr. 3. F.

*Prereq:* 6 credits of mathematics; credit or concurrent enrollment in EDUC 448 or EDUC 497 or EDUC 597

Explore geometry and measurement through research-based pedagogies in K-12 classrooms. An investigative approach involving problem solving, reasoning and proof, connections, and communication are emphasized.

**EDUC 510: Foundations of Game-based Learning**

(Cross-listed with HCI). Cr. 3. S.

*Prereq:* 12 Graduate Credits

Theories, principles and best practices of utilizing games in educational environments. Topics include the theoretical foundations of learning games and game play, identity development in online environments, and assessment of learning in and out of games.

**EDUC 511: Technology Diffusion, Leadership, and Change**

(3-0) Cr. 3. S.

*Prereq:* Admission to graduate study, EDUC 501 or equivalent and EDUC 505 or equivalent

Principles and practices of technology diffusion, leadership and school change. Coursework focuses on technology diffusion broadly and implications on educational contexts. Leadership frameworks and strategies for professional development and organizational change are examined, as well as new literacy practices, critical theory, and current debates in the field.

**EDUC 512: Research Trends in Educational Technology**

(3-0) Cr. 3. F.

*Prereq:* Graduate Classification

Critical review and synthesis of current research trends in educational technology. Designed for students to synthesize knowledge of issues in research, and methods of conducting research in practice.

**EDUC 513: Mathematical Problem Solving in K-12 Classrooms**

(3-0) Cr. 3. S.

*Prereq: 6 credits of mathematics*

Develop problem solving strategies across all strands of mathematics. Issues surrounding the appropriate role of problem solving in K-12 mathematics classrooms are discussed, including distinctions among teaching "about," "for," and "through" problem solving. Emphasis on task modification and mathematical modeling.

**EDUC 514: Introduction to Science Teaching and Learning**

(1-2) Cr. 1-4. SS.

*Prereq: Admission to M.A.T. program*

Introduction to critical issues facing science education, science education goals reflecting contemporary purposes of schooling, and how people learn science.

**EDUC 515: Action Research in Education**

(3-0) Cr. 3. S.

*Prereq: Admission to graduate study.*

Methods of conducting and communicating action research focused on improving educational practices. Develop first cycle of action plan with purpose of investigating an educational setting. Learn to identify problems to investigate, select appropriate research methods, collect and analyze data, and draw conclusions from research.

**EDUC 516: Antiracist Curriculum Development and Implementation**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in Education*

Introduction to historical, sociological, philosophical and pedagogical foundations of antiracist/multicultural education. Examination of causes of racism, and other forms of discrimination from different theoretical perspectives and experiential exercises.

**EDUC 517: Student Teaching**

(Dual-listed with EDUC 417). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program or licensed teacher; approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching.

**EDUC 517A: Student Teaching: Social Studies-Middle School**

(Dual-listed with EDUC 417A). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 517B: Student Teaching: Physical Sciences, Chemistry or Physics**

(Dual-listed with EDUC 417B). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in physical sciences grades 5-12.

**EDUC 517C: Student Teaching: Mathematics**

(Dual-listed with EDUC 417C). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in mathematics grades 5-12.

**EDUC 517D: Student Teaching: Biological Sciences**

(Dual-listed with EDUC 417D). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in biological sciences grades 5-12.

**EDUC 517G: Student Teaching: World Language**

(Dual-listed with EDUC 417G). (Cross-listed with WLC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**EDUC 517J: Student Teaching: Earth Sciences**

(Dual-listed with EDUC 417J). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in earth sciences grades 5-12.

**EDUC 517M: Student Teaching: Science - Basic**

(Dual-listed with EDUC 417M). Cr. arr. Repeatable. F.S.

*Prereq: Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in basic sciences grades 5-12.

**EDUC 517N: Student Teaching: International**

(Dual-listed with EDUC 417N). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*  
Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 517P: Student Teaching: Social Studies-High School**

(Dual-listed with EDUC 417P). Cr. arr. Repeatable. F.S.

*Prereq: GPA 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 517R: Student Teaching: Music-Elementary**

(Dual-listed with EDUC 417R). (Cross-listed with MUSIC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 517S: Student Teaching: Music-Secondary**

(Dual-listed with EDUC 417S). (Cross-listed with MUSIC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program; approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**EDUC 518: Secondary Science Methods I**

(Dual-listed with EDUC 418). (3-0) Cr. 3. F.

*Prereq: EDUC 280L or EDUC 514; undergraduate students must register concurrently for EDUC 280A; graduate students must register concurrently for EDUC 591D. Admitted to the Educator Preparation Program.*

Develop an understanding of research-based practices for effective and equitable science teaching that align with state and national standards. Emphasis is on the character and role of science inquiry, teaching behaviors and strategies, and actively engaging students in self-evaluation and evidence-based inquiry learning experiences.

**EDUC 519: Secondary Science Methods II**

(Dual-listed with EDUC 419). (3-0) Cr. 3. S.

*Prereq: EDUC 418 or EDUC 518, undergraduate students must register concurrently for EDUC 480B, 480D, or 480J; graduate students must register concurrently for EDUC 517B, 517D, 517J or 517P.*

Advancing a research-based framework for effective and equitable science teaching rooted in the idea that students need opportunities to make sense of phenomena, and grapple with scientific ideas using authentic science and engineering practices while observing science safety.

**EDUC 520: Bilingualism & The Education of Latinx Youth**

(Dual-listed with EDUC 420). (3-0) Cr. 3. F.

*Prereq: EDUC 405 or EDUC 406*

Introduction to research on bilingualism and examination of the social, historical, and political contexts of Spanish/English education in the U.S. Attention to policy environment, school program structure, mode of classroom instruction, family and community context, and attainment of bilingualism and biculturalism for Latinx youth.

Meets U.S. Diversity Requirement

**EDUC 521: Introduction to the Teaching and Learning of Mathematics and Science**

Cr. 3. SS.

*Prereq: Admission into graduate program secondary mathematics or science education*

Provides future secondary teachers with opportunities to explore learning theories and approaches for teaching mathematics and science, especially those related to constructivism and social constructivism. Opportunities to understand how students learn mathematics and science and how to assess secondary students' understanding in these content areas. Includes 12-hours (2 full days) of classroom observation in a nearby middle or high school and may include other practical experiences in teaching math and science.

**EDUC 522: Teaching and Learning Iowa History**

(Dual-listed with EDUC 422). Cr. 3. SS.

Multicultural and social justice focus on Iowa history; different theme each summer. Effective pedagogical and assessment strategies for integrating these themes into K-12 curriculum.

**EDUC 523: Teaching Students who Struggle in Mathematics**

(3-0) Cr. 3. S.

*Prereq: EDUC 438 or EDUC 448*

Explore and implement research-based instructional practices with K-8 students who are struggling with learning essential mathematical concepts.

**EDUC 526: Principles of Secondary Education**

(Dual-listed with EDUC 426). (3-0) Cr. 3. F.S.SS.

*Prereq: Senior classification and admitted to Educator Preparation Program*

Introduction to secondary education teaching strategies, lesson planning that provides equitable learning opportunities for all students, classroom management, legal aspects of schools, professional and ethical issues, current educational issues, professional learning communities, and social-justice oriented teaching.

**EDUC 529: Educational Psychology and the Secondary Classroom**

(3-0) Cr. 3. SS.

*Prereq: Bachelor's degree; admission into a graduate level teacher licensure program*

Analysis of psychological research theory related to learning, cognition, motivation, individual differences, and teaching techniques. Student and classroom assessment to facilitate positive learning outcomes. Adaption and differentiation of instruction to meet individual learners' needs. This course can only be used for teacher licensure programs. It is not acceptable for use in meeting the non-licensure M.Ed., M.S. or Ph.D. requirements.

**EDUC 533: Theories of Learning**

(Cross-listed with PSYCH). (3-0) Cr. 3. F.

Major theories of learning and cognition in educational settings. Emphasis on behavioral, cognitive, constructivist, and sociocultural theories and their implications for educational policy and practice.

**EDUC 536: Sociocultural Theories of Learning**

(3-0) Cr. 3. SS.

Study of sociocultural learning theories, including how knowledge is constructed through interactions and how learning is embedded in these interactions. Examination of how particular sociocultural approaches to learning can inform responsive teaching and responsive research, and impact opportunities for educational equity.

**EDUC 541: How People Learn: Implications for Teaching Science and Mathematics**

(3-0) Cr. 3.

Examination of theories of learning and motivation in science and mathematics and their application to teaching and current research in science and mathematics education.

**EDUC 546: Advanced Pedagogy in Science Education**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Advanced examination of effective and equitable science teaching, emphasizing teacher behaviors and strategies, methods of self-evaluation, and current issues and trends in science education.

**EDUC 547: Nature of Science**

(Dual-listed with EDUC 347). (3-0) Cr. 3.

*Prereq: Admitted to the Educator Preparation Program (Secondary Science Education) or permission of instructor*

The history, philosophy, and sociology of science, how scientific knowledge differs from other forms of knowledge, and the relationship of the Nature of Science to science teaching and learning.

**EDUC 548: Restructuring Science Activities**

(3-0) Cr. 3. SS.

*Prereq: Admitted to Educator Preparation Program or teaching license*

Modification of laboratory activities and other everyday science activities so they are more congruent with how students learn, the nature of science, and national standards.

**EDUC 550: Ethnicity and Learning**

(Dual-listed with EDUC 450). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: EDUC 332 or EDUC 333; EDUC 406*

Examination of cultural relevance in education. Development and application of strategies and techniques for implementing multicultural goals and multiethnic perspectives in PreK-12 school classroom settings.

**EDUC 551: Foundations of Reading and Language Arts**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: Teaching license*

Analyzing, discussing, and researching the theory and practice of current literacy issues.

**EDUC 552: Assessment for Literacy and Learning**

(Dual-listed with EDUC 452). (3-0) Cr. 3. F.S.SS.

*Prereq: EDUC 378 or equivalent. Concurrent enrollment in EDUC 488.*

Identification, analysis and correction of reading problems in five areas: print knowledge, integration of print knowledge, oral reading fluency, vocabulary, and comprehension.

**EDUC 553: Teaching Adolescents who Struggle with Reading**

(Cross-listed with SP ED). (3-0) Cr. 3. F.S.

*Prereq: Teaching license or senior status*

Instructional strategies for enhancing the fluency, vocabulary and comprehension of adolescents with reading difficulties. Attention to content-area reading materials and strategies.

**EDUC 555: Literacy, Leadership, and Advocacy**

(3-0) Cr. 3. S.

*Prereq: Graduate Standing*

Examination of the roles of literacy specialists in diverse pre-K-12 schools and communities. Particular focus placed on current theories, research, standards, and policies relative to literacy processes and instruction, including culturally responsive literacy; successful methods of supporting teachers and other school personnel in planning, implementing, and evaluating literacy instruction for all students.

**EDUC 556: Integrating Technology into Literacy**

(Dual-listed with EDUC 456). (3-0) Cr. 3. F.SS.

*Prereq: EDUC 201 or EDUC 203; EDUC 377*

Methods and strategies used to integrate technology into K-8 literacy. Examination of the use and evaluation of technology appropriate for elementary literacy classrooms.

**EDUC 558: Perspectives on Reading Comprehension**

(3-0) Cr. 3. F.

*Prereq: Graduate standing*

Critical examination of the topics central to the study of reading comprehension, including processes, development, contexts, motivation, teaching and learning, and assessment. Reading and discussion of research literature in reading comprehension and comprehension instruction.

**EDUC 559: Critical Approaches to Teaching Children's and Adolescent Literature**

(Dual-listed with EDUC 459). (3-0) Cr. 3. F.S.SS.

*Prereq: Admitted to Educator Preparation Program; EDUC 377 and EDUC 378.*

Research and discussion of issues surrounding the classroom use of literature for children and young adults including censorship, diversity, selection, critical literacy and the influences of technology. Meets U.S. Diversity Requirement

**EDUC 565: Literacy: Connecting Research, Policy and Practice**

(3-0) Cr. 3. F.S.

*Prereq: Graduate standing*

Critical examination of current policy initiatives and reform efforts that affect how literacy is viewed, assessed, and practiced, as well as how literacy professionals are prepared for their roles in public schools and colleges.

**EDUC 567: Teaching Secondary Learners with Mathematics Difficulties**

(Cross-listed with SP ED). (3-0) Cr. 3.

*Prereq: Secondary teaching experience*

Instructional methods and assessment techniques for secondary students struggling to learn mathematics. Particular emphasis on current research, practices, and trends in mathematics interventions for at-risk students and students with disabilities.

**EDUC 568: New Media Literacies: Understanding Research and Practice**

(3-0) Cr. 3. F.

*Prereq: Graduate Standing*

Designed to increase awareness and understanding of critical issues surrounding the evolving concept of literacy and examine the effect that technology has on the literacy we use every day, teach in our schools, and need in order to function as 21st century citizens.

**EDUC 569: Critical Disciplinary Literacy across the Content Areas**

Cr. 3. S.

*Prereq: Graduate classification*

Guided by frameworks of critical literacies and sociocultural theories of disciplinary literacy, students investigate the specialized and unique histories, discourses, practices, norms, and skills of select disciplines/programs/fields. Course is intended/differentiated for graduate students from various disciplines/programs/fields. Students will design their own inquiry-based critical disciplinary literacy research project.

**EDUC 575: International Travel Study in Education**

(Dual-listed with EDUC 475). Cr. 1-6. Repeatable, maximum of 3 times. SS.

*Prereq: EDUC 275 Program leader should have accepted participating students to the international travel study. Students enrolled in EDUC 575 (graduate level) must have completed 6 graduate credits to be eligible for the course.*

Seminar-based course for undergraduate and graduate students to develop a better understanding around global issues related to teaching, learning, curriculum, and educational policy through international travel study. 1 to 6 week duration involving study in a country other than the US.

**EDUC 577: Historical Perspectives on Technology Equity: Implications for Policy and Practice**

(3-0) Cr. 3. S.

*Prereq: Graduate Status*

Examination of the definition and origin of the "digital divide" and its relationship to the histories of racism, sexism, classism, and imperialism/globalization. Exploration of the historical, political, sociological, and economic factors that engender global inequities. Exploration and analysis of research-based alternative approaches to alleviating technology inequities in educational settings.

**EDUC 578: Pedagogy, Equality of Opportunity, and the Education of Blacks in the United States**

(3-0) Cr. 3.

*Prereq: Graduate or senior level status or permission of instructor*

Examination of the historical, social, economic, political, and legal contexts of the education of Blacks in the U.S. Educational theories and philosophies, Critical Race Theory and Black Feminist Thought form the framework for investigating broad-based, multiple issues of education for Blacks in the U.S. as they are situated in the prevailing dominant views.

**EDUC 580: Studies in the Foundations of Education in the United States**  
(3-0) Cr. 3. SS.

*Prereq: Admitted to graduate Educator Preparation Program*

Introduction to the historical and contemporary landscape of schooling in the United States. Emphasis is placed on topics and tensions in the relationship between school and society (e.g. equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching and learning in public schools. Designed for students in a graduate licensure program.

**EDUC 581: Philosophy of Education**

(Dual-listed with EDUC 481). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to philosophy of education. Emphasis is placed on historical and contemporary debates about the nature and purposes(s) of education in a just society. Possible topics include questions such as: When is one justified in claiming to know or to have learned? Who is morally responsible for a learner's education or schooling? What is a just distribution of educational opportunities? How might one teach philosophically?.

**EDUC 582: History of Public Schooling in the United States**  
(3-0) Cr. 3.

*Prereq: Graduate classification*

Examination of the history of public schools in the United States. Historicizes the development of an educational system marked by both profound expectations and extreme inequalities. Readings include primary and secondary materials.

**EDUC 583: Inequality & Schooling in the U.S.**

(3-0) Cr. 3. S.

*Prereq: Graduate status*

General introduction to the disciplinary tools of social and cultural studies to examine historical and contemporary inequalities and attempts to disrupt them in U.S. schools. Required for all TLLP doctoral students.

**EDUC 588: Supervised Tutoring in Reading**

(Dual-listed with EDUC 488). (2-2) Cr. 3. F.S.SS.

*Prereq: EDUC 488; EDUC 378 or equivalent; concurrent enrollment in EDUC 452. EDUC 588: Graduate status; concurrent enrollment in EDUC 552.*

Using formal and informal diagnostic procedures to plan and implement individualized reading instruction. Field experience in tutoring and a related research project.

**EDUC 590: Special Topics**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590A: Special Topics: Curriculum**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590B: Special Topics: Educational Technology**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590C: Special Topics: Science Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590D: Special Topics: Secondary Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590F: Special Topics: Social and Cultural Studies**

Cr. 1-3. Repeatable. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590G: Special Topics: Mathematics Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590I: Special Topics: Elementary Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590J: Special Topics: World Language Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590K: Special Topics: Educational Psychology**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590L: Special Topics: Social Studies Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 590M: Special Topics: Literacy Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 591: Graduate Level Pre-Student Teaching Experience**

(0-2) Cr. 0.5-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: 15 graduate credits in special area; admission to teacher education.*

Supervised pre-student teaching experience in secondary schools.

Supervision level 3.



**EDUC 591C: Supervised Field Experience: Elementary Education**

(0-2) Cr. 0.5-6. F.S.SS.

*Prereq: 15 graduate credits in special area*

Supervised on-the-job field experience in special area.

**EDUC 591D: Graduate Level Pre-Student Teaching Experience: Secondary Science**

(0-2) Cr. 0.5-6. Repeatable. F.S.

*Prereq: 15 graduate credits in specialty area; admission to teacher education*

Supervised pre-student teaching experience in secondary science education. Supervision level 3.

**EDUC 591G: Graduate Level Pre-Student Teaching Experience: Secondary Mathematics Education**

(0-2) Cr. 0.5-6. Repeatable. F.S.

*Prereq: 15 graduate credits in specialty area; admission to teacher education*

Supervised pre-student teaching experience in mathematics education. Supervision level 3.

**EDUC 591M: Supervised Field Experience: Literacy**

(0-2) Cr. 0.5-6. F.S.SS.

*Prereq: 15 graduate credits in special area*

Supervised on-the-job field experience in special area.

**EDUC 591N: Supervised Field Experience: College Teaching**

(0-2) Cr. 0.5-6. Repeatable, maximum of 3 times. F.S.

*Prereq: 15 graduate credits in special area.*

Supervised on-the-job field experience in special area.

**EDUC 593: Workshops**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593A: Workshops: Curriculum**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593B: Workshops: Educational Technology**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593C: Workshops: Science Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593D: Workshops: Secondary Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593F: Workshops: Social and Cultural Studies**

Cr. 1-3. Repeatable. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593G: Workshops: Mathematics Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593I: Workshops: Elementary Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593J: Workshops: World Language Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593K: Workshops: Educational Psychology**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593L: Workshops: Social Studies Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 593M: Workshops: Literacy Education**

Cr. 1-3. F.S.

*Prereq: 9 graduate credits in Education*

**EDUC 594: Contemporary Curriculum Theory and Principles**

(3-0) Cr. 3. F.

*Prereq: Graduate standing*

Theoretical and historical perspectives of contemporary curriculum; social, cultural, and epistemological aspects of curriculum theory; diverse philosophical positions and approaches to understanding curriculum as it relates to educational settings.

**EDUC 595: Teaching Disciplinary Literacy**

(Dual-listed with EDUC 395). (3-0) Cr. 3. F.S.SS.

Analysis and application of strategies to enhance students' disciplinary literacy development in middle and secondary school setting. Research paper related to a course topic for EDUC 595.

**EDUC 597: Teaching Secondary School Mathematics**

(3-0) Cr. 3. F.

*Prereq: 15 credits in college mathematics; Admitted to the Educator Preparation Program.*

Develop an understanding of instructional planning, lesson implementation, and assessment in grades 5-12 mathematics, with a focus on reform-based mathematics, equity, and conceptual understanding.

**EDUC 599: Creative Component**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education*

Creative Component.

**EDUC 599A: Creative Component: Curriculum**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599B: Creative Component: Educational Technology**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599C: Creative Component: Science Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599D: Creative Component: Secondary Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599F: Creative Component: Social and Cultural Studies**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599G: Creative Component: Mathematics Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599I: Creative Component: Elementary Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599J: Creative Component: World Language Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599K: Creative Component: Educational Psychology**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599L: Creative Component: Social Studies Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***EDUC 599M: Creative Component: Literacy Education**

Cr. 1-3. F.S.SS.

*Prereq: 9 graduate credits in Education***Courses for graduate students:****EDUC 602: Educational Inquiry in Action**

(3-0) Cr. 3. S.

*Prereq: EDUC 601*

Opportunities to learn about a variety of faculty research in the School of Education, engage faculty in conversation about their research, and continue reflecting on the theory and practice of educational inquiry. Offered on a satisfactory-fail basis only.

**EDUC 603: Advanced Learning Environments Design**

(Cross-listed with HCI). (3-0) Cr. 3. S.

*Prereq: EDUC 503*

Exploration of advanced aspects of the learning environments design process. Application of analysis, design, development and production, evaluation, implementation, and project management principles. Theory and research in educational technology provides the foundation for design decisions. Focus on current trends in learning environment design and the production and use of educational technology.

**EDUC 608: Social Media and Education**

(Cross-listed with HCI). (3-0) Cr. 3. F.

*Prereq: 12 graduate credits*

Increase understanding of how social media is changing traditional concepts of identity, literacy, citizenship and more. Develop an online social presence through active social media participation.

**EDUC 610: Digital Learning in Teacher Education**

(3-0) Cr. 3. F.

Research on using technology in teacher education programs. Application examples studied. Field component involving relating material from class to a teacher education situation.

**EDUC 611: Philosophical Foundations of Educational Technology**

(3-0) Cr. 3.

*Prereq: 12 graduate credits in Education*

Exploration of philosophies of science that serve as foundations for research and practice in educational technology, including positivism, post-positivism, interpretivism/constructivism, and critical theory. The roles of language, nature of truth and reality, and acceptable ways of knowing are explored in terms of their implications for educational technology design, delivery, research, and scholarship.

**EDUC 612: Socio-psychological Foundations of Educational Technology**

(3-0) Cr. 3.

*Prereq: 12 graduate credits in Education*

Examining socio-psychological theories of educational technology, their historical development, and their implications for the research and design of learning and instructional environments. Emphasis on cognitive and social constructivist paradigms and the creation and use of learning environments supported by technology.

**EDUC 615: Seminar**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615A: Seminar: Curriculum**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615B: Seminar: Educational Technology**

(0-2) Cr. 1. F.S.

Selected topics in educational technology; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615C: Seminar: Science Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615D: Seminar: Secondary Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615F: Seminar: Social and Cultural Studies**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615G: Seminar: Mathematics Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615I: Seminar: Elementary Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615J: Seminar: World Language Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615K: Seminar: Educational Psychology**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615L: Seminar: Social Studies Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 615M: Seminar: Literacy Education**

(0-2) Cr. 1. F.S.

Selected topics in curriculum and instruction; an analysis of research potential; evaluation of impact upon the profession; implications for additional research.

**EDUC 680: Motivation in Educational Contexts**

(3-0) Cr. 3.

*Prereq: Graduate Status.*

Current conceptualizations and research regarding motivation in educational contexts from Pre-K through college. Understanding historical development of a body of research, including critical examination of inclusivity. Implications for education and practice.

**EDUC 690: Advanced Special Topics**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690A: Advanced Special Topics: Curriculum**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690B: Advanced Special Topics: Educational Technology**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690C: Advanced Special Topics: Science Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690D: Advanced Special Topics: Secondary Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690F: Advanced Special Topics: Social and Cultural Studies**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

**EDUC 690G: Advanced Special Topics: Mathematics Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 690I: Advanced Special Topics: Elementary Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 690J: Advanced Special Topics: World Language Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 690K: Advanced Special Topics: Educational Psychology**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 690L: Advanced Special Topics: Social Studies Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 690M: Advanced Special Topics: Literacy Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699: Research**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699A: Research: Curriculum**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699B: Research: Educational Technology**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699C: Research: Science Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699D: Research: Secondary Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699F: Research: Social and Cultural Studies**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699G: Research: Mathematics Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699I: Research: Elementary Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699J: Research: World Language Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699K: Research: Educational Psychology**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699L: Research: Social Studies Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education***EDUC 699M: Research: Literacy Education**

Cr. arr. Repeatable.

*Prereq: 9 graduate credits in Education*

## Educational Administration (EDADM)

***Any experimental courses offered by EDADM can be found at:****registrar.iastate.edu/faculty-staff/courses/explisting/ (http://  
www.registrar.iastate.edu/faculty-staff/courses/explisting/)***Courses primarily for graduate students, open to qualified undergraduates:****EDADM 541: Principles of Inclusive Educational Leadership**

(3-0) Cr. 3. F.S.SS.

*Prereq: Teacher licensure and permission of instructor*

Basic principles of educational organizations, including an understanding of organizational behavior and theoretical approaches to administration. Exploration of substantive elements related to school reform, such as the change process, current issues in education, and developing a shared vision and mission around inclusive leadership.

**EDADM 551: Supervision for Learning Environments**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Study of effective classroom instructional practices that reflect current principles of learning. Understanding and practice of supervisory techniques that support teachers in improving the teaching and learning process, including skills in observational data collection, data analysis, collaboration, and conferencing skills.

**EDADM 552: Contemporary Issues in Principal Leadership**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Develops an equity-centered principal and building-level leadership understanding of school/work and community context. Emphasis placed on understanding essential tasks of building-level leadership and management; connecting management and operational decisions to mission and vision; building expertise in instructional leadership to improve teacher practice and student learning; leveraging school culture/atmosphere to provide opportunities and success for all students and their learning needs; advocacy for resources; and, examining the role of principals in a changing world.

**EDADM 554: Leading School Reform**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Study of principles of transformational leadership and collaborative decision-making skills. Leadership activities that facilitate the development of a school culture that embraces change and school reforms that result in high quality schools dedicated to improved student achievement.

**EDADM 556: Leading for Equitable Learning in School Systems**

(3-0) Cr. 3.

*Prereq: EDADM 541*

This course builds on Ed Admin 541, Principles of Educational Leadership, to explore more fully how a leader can establish a vision for equitable and excellent learning. It provides historical, practical and theoretical perspectives on the culture and systems of schools, particularly in an age of accountability.

**EDADM 557: Human Resource Development for Learning**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Leadership theory and practice that focuses on the professional development of school staff to promote improved student learning. Principles of school personnel evaluation; legal issues related to hiring, retention, and dismissal; evaluation models for professional and classified staff; and effective professional development models to support lifelong learning and reflective practice.

**EDADM 558: Diverse Learning Needs**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

This course is designed to address practical and ethical dimensions of school leadership, especially related to disability status, race, gender, language status, and other minoritized statuses. Specific focus will be on the various ecological contexts of the school, the community, and the family as means of making effective use of multiple resources to enrich education.

**EDADM 559: Curriculum Leadership**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Analysis of PK-12 school curricula (hidden, explicit, and null), including current and historical curriculum and instructional issues; design, development, and evaluation of instructional materials. Promoting a vision of learning and instructional program conducive to student learning and staff professional growth. Examining the role curricula play in maintaining and advancing bodies of thought, norms, and historic attitudes. Draws on critical curriculum leadership theories to promote socially just curriculum leadership.

**EDADM 575: Education Law and Ethics**

(3-0) Cr. 3. F.S.SS.

*Prereq: EDADM 541*

Examination of constitutional, statutory, and judicial provisions as a basis for the legal operation of educational institutions. Rights and ethical responsibilities of school leaders are examined in relation to their roles and responsibilities with boards, other school personnel, and students.

**EDADM 590: Special Topics**

Cr. 1-4. Repeatable.

*Prereq: 9 credits in education***EDADM 591: Supervised Field Experience**

Cr. 1-6. Repeatable.

*Prereq: EDADM 541 and admission to program and instructor's approval*

Supervised on-the-job field experience in special areas.

**EDADM 591A: Supervised Field Experience: Elementary Principal**

Cr. 1-6. Repeatable.

*Prereq: EDADM 541 and admission to program and instructor's approval*

Supervised on-the-job field experience in special areas.

**EDADM 591B: Supervised Field Experience: Secondary Principal**

Cr. 1-6. Repeatable.

*Prereq: EDADM 541 and admission to program and instructor's approval*

Supervised on-the-job field experience in special areas.

**EDADM 593: Workshops**

Cr. 1-4.

*Prereq: 9 credits in education***EDADM 599: Creative Component Development**

Cr. 1-3.

*Prereq: 9 credits in educational administration***Courses for graduate students:**

**EDADM 615: Seminar**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615A: Seminar. Client Focus**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615B: Seminar. Research**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615C: Seminar. Quality Improvement**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615D: Seminar. Special Services**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615E: Seminar. Assessment**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 615F: Seminar. Leadership**

Cr. 1-3. Repeatable.

In-depth study of administrative topics of contemporary interest and importance.

**EDADM 620: Program Induction Leadership Seminar**

(3-0) Cr. 3. SS.

*Prereq: EDADM 541*

Assessment of candidate skill areas, including communication, leadership, technology, and team facilitation for the development of an individualized learning plan for the program. Orientation to program expectations and leadership challenges in the context of schooling for a global society.

**EDADM 621: Aligning the System for Student Achievement**

(5-0) Cr. 5. F.

*Prereq: EDADM 541*

Alignment of system goals and leadership theory with student achievement, governance, systems thinking, and communication and collaboration with various publics.

**EDADM 622: Maximizing Human and Financial Resources for Student Achievement**

(3-0) Cr. 3. S.

*Prereq: EDADM 541*

Allocation of system resources to enhance student achievement; human resource development and negotiations; and coaching and evaluating the administrative team.

**EDADM 623: Mid-Program Leadership Seminar**

(1-0) Cr. 1. SS.

*Prereq: EDADM 541*

Mid-program assessment of candidate progress and exploration of leadership strategies for working with diverse populations.

**EDADM 624: School Finance**

(2-0) Cr. 2. SS.

*Prereq: EDADM 541*

General issues of school finance and managing a school district's financial responsibilities. Role of the federal, state and local governments in educational finance, tax issues, and structures; budgeting procedures; and financial analysis and accountability. Includes attendance at selected sessions of the Iowa School Business Management Academy in the spring and two additional class sessions during the summer.

**EDADM 625: Social Justice Leadership in Organizations**

(4-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: Graduate standing*

Study of the principles of transformative leadership and leadership for social justice. Exploration of scholarly and practitioner-based perspectives on equitable school organizations, with particular emphasis on how to develop culturally responsive and community oriented systems-level leadership.

**EDADM 626: Equitable School Finance**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: Graduate standing*

Examine the equitable management of a school district's financial responsibilities. Coursework addresses the role of the federal, state, and local governments in educational finance, tax issues, and structures; bonding; budgeting procedures; and financial analysis and accountability. Student attendance required at the annual Iowa School Business Management Academy.



**EDADM 627: Transformative Instructional Leadership**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Graduate status*

Accountability strategies for applying leadership theory to student achievement, evaluation, governance, systems thinking, change agency, and communication and collaboration with various publics. Engage with the PSEL and NELP standards for administrators and districts, coach and evaluate their administrative team. Conduct an analysis of PK-12 school curricula (hidden, explicit, and null), including current and historical curriculum and instructional issues; design, development, and evaluation of instructional materials. Develop a vision of learning and instructional program that promotes student learning and staff professional growth. Examine the role curricula play in maintaining and advancing bodies of thought, norms, and historic attitudes. Utilize critical curriculum leadership theories to promote socially just curriculum and instructional leadership. Clinical field work requirement embedded in course- 50hrs per course to meet the required 400 hrs. total.

**EDADM 631: Achieving Results Through Accountability Strategies**

(5-0) Cr. 5. F.

*Prereq: EDADM 541*

Accountability strategies for applying leadership theory to student achievement, governance, systems thinking, change agency, and communication and collaboration with various publics.

**EDADM 632: Using System Assets to Create a Culture of Learning**

(3-0) Cr. 3. S.

*Prereq: EDADM 541*

Leadership strategies to promote a culture of high student achievement; effective human capital management, including recruitment and induction of new personnel; and effective communication with parents and other patrons.

**EDADM 633: Career Induction Leadership Seminar**

(1-0) Cr. 1. SS.

*Prereq: EDADM 541*

Development of entry plan for creating a culture of collaboration; professional growth plan for first year in new position; and authentic performance assessment of values and beliefs platform.

**EDADM 634: School Business Management and Accountability**

(2-0) Cr. 2. SS.

*Prereq: EDADM 541*

Management of school operations; accountability and ethical business practices; risk management; school plant operations, food service and student transportation. Includes attendance at selected sessions of the Iowa School Business Management Academy in the spring and two additional class sessions during the summer.

**EDADM 635: Ethical Governance and Policy**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: Graduate standing*

Explores ethics to support equitable systems-level administrative practice, with attention to the development of personal and professional codes of ethics and social justice. Examine constitutional, statutory, and judicial provisions as a basis for the legal operation of educational institutions which serve school boards, school personnel, students, and communities.

**EDADM 636: Culturally Responsive Leadership**

(3-0) Cr. 3.

*Prereq: Admission to the Education Doctorate program*

Culturally Responsive Leadership as a pillar of social justice in educational settings. Historical origins of and emerging frameworks of Culturally Responsive Leadership; contextualizing how educational leaders can embed culturally responsive practices.

**EDADM 637: Equity in HR and Fiscal Management**

(3-0) Cr. 3. Alt. SS., offered odd-numbered years.

*Prereq: Admission to the Ed.D. Program*

Hiring of personnel and management of school operations; accountability and ethical business practices; risk management; school plant operations, food service and student transportation. Includes attendance at selected sessions of the Iowa School Business Management Academy at the end of the spring term and three additional class sessions during the summer. SBO Academy - 18 contact hours on topics related to legal governance, human resources, risk management insurance, support services: transportation, nutrition services, facility planning and management and fiscal management will be a part of the Iowa School Business Management Academy (ISBMA).

**EDADM 651: Ethics, Spirituality, and Social Justice in Administrative Practice**

(3-0) Cr. 3. Alt. SS., offered even-numbered years.

Exploration of ethical models and practice of educational administrators. Participants develop personal and professional codes of ethics: define concepts of care, spirituality, democracy, equity, diversity, and social justice; and explain how those concepts relate to students' academic and social success. Case studies offer opportunities to consider moral and legal consequences of decision-making. Participants develop their own vision of leadership.

**EDADM 690: Advanced Special Topics**

Cr. 1-3. Repeatable.

*Prereq: 9 credits in educational administration*

**EDADM 691: Clinical Dilemmas of Practice**

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: EDADM 541, admission to program, and instructor's approval*

Supervised on-the-job field leadership experience in clinical dilemmas of practice. Offered on a satisfactory-fail basis only.

**EDADM 699: Dissertation Research**

Cr. arr. Repeatable.

*Prereq: 9 credits in education*

## Educational Leadership and Policy Studies (EL PS)

*Any experimental courses offered by EL PS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**EL PS 591: Social Justice Field Experience**

Cr. 1-3. F.S.SS.

*Prereq: EL PS 620*

Supervised field experience in equity and social justice inside/outside higher education.

**Courses for graduate students:**

**EL PS 615: Thematic Seminars**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615A: Thematic Seminars: Communication and Team Building**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615B: Thematic Seminars: Governance, Politics and Policies**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615C: Thematic Seminars: Law, Equity, Equality**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615D: Thematic Seminars: Ethics, Justice, and Caring**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615E: Thematic Seminars: Problem Solving and Planning**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 615F: Thematic Seminars: Critical and Creative Thinking**

Cr. 1. F.S.SS.

*Prereq: Admission to educational leadership doctoral program*

**EL PS 616: Capstone Experience**

Cr. 3. F.S.

*Prereq: 4 credits of EL PS 615*

This experience is designed to explore a topic addressed in one of the thematic seminars. The product of the capstone experience is a written paper of sufficient quality to be submitted to a scholarly journal for review.

**EL PS 620: Education for Social Justice**

(3-0) Cr. 3. F.

Introduction to social justice theory, research, and practice from a variety of theoretical perspectives in the context of education and broader society.

**EL PS 621: Pedagogies of Dissent**

(Cross-listed with WGS). (3-0) Cr. 3. S.

*Prereq: EL PS 620*

Critical examination of the theoretical foundations of contemporary and historical pedagogical traditions that seek to challenge the status quo, expand justice, and deepen democracy.

**EL PS 622: Decolonizing Praxis**

(3-0) Cr. 3. S.

*Prereq: EL PS 620*

Critically probes the philosophical and historical foundations of indigenous epistemologies and knowledge systems. Examination of policy, social, theoretical, research, and P-20 educational issues from a decolonial perspective.

**EL PS 624: Critical Race Theory in Education**

(3-0) Cr. 3. SS.

Exploration of the central tenets of critical race theory. Examination of policy, social and educational issues from a critical race perspective.

**EL PS 625: Gender and Sexuality in Education**

(3-0) Cr. 3. SS.

Exploration of gender and sexuality in education.

**EL PS 626: Social Justice and Social Change in Education**

(3-0) Cr. 3. F.

*Prereq: EL PS 621*

An examination of how changes in the interest of social justice have occurred historically in education. Exploration of social movements and theories of social change.

**EL PS 630: Education Policy and Analysis**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Advanced graduate standing*

Introduction to current theoretical, practical, and research-based policy debates related to the P-20 educational system. Critical analysis and evaluation of government policies, initiatives, funding, and other regulatory levers related to education. Intensive reading and discussion of the nature of theory, evidence, practice of education policy.

**EL PS 651: Social Foundations of Education**

(3-0) Cr. 3.

*Prereq: Graduate standing and admission to Ed.D. program*

Introduction to the historical and contemporary landscape of P-20 schooling in the United States. Emphasis on topics and tensions in the relationship between school and society (e.g. equity of access to education and competing purposes of education) and the implications of these topics and tensions for teaching, learning, and leadership in schools across the P-20 continuum.

**EL PS 652: Organizational Theory in P-20 Systems**

(3-0) Cr. 3. S.

*Prereq: Graduate standing and admission to Ed.D. program*

Theory of inclusive leadership and organizations for the Education Doctorate program in the School of Education. Topics for practitioner-scholars related to educational leadership, current issues in the field, and program success.

**EL PS 653: Contemporary Issues of Equity and Diversity**

(3-0) Cr. 3.

*Prereq: Graduate standing and admission to Ed.D. program*

Contemporary issues of equity and diversity across P-20+ school settings. Relevant history, philosophy, theory, and research is highlighted to understand how equity and diversity is conceptualized, addressed, researched, and contextualized at micro and macro levels of educational settings.

**EL PS 654: Scholar-Practitioner Inquiry**

(3-0) Cr. 3.

*Prereq: Graduate standing and admission to Ed.D. program*

Introductory doctoral research course addresses the fundamental concepts and procedures that form the foundations of empirical research in the social sciences and education. Orient scholar-practitioners regarding how to design an empirical research study that identifies a problem of practice, and developing the necessary knowledge and skills to complete an action research dissertation.

**EL PS 655: Qualitative Inquiry in P-20 Education**

(3-0) Cr. 3. S.

*Prereq: Admission to the Ed.D. in Education program*

Qualitative research approaches and methods for applied research in P-20 education settings; research designs, data collection, and data analysis with a focus on action research.

**EL PS 657: Dissertation in Practice Seminar**

(3-0) Cr. 3.

*Prereq: Admission to Ed.D. degree program*

Development of dissertation in practice proposal. Formulating research questions, theoretical/conceptual frameworks, literature review, research design, and methodology.

## Electrical Engineering (E E)

***Any experimental courses offered by E E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**E E 166: Professional Programs Orientation**

(Cross-listed with CPR E). Cr. R. F.S.

(1-0) Overview of the nature and scope of electrical engineering and computer engineering professions. Overview of portfolios. Departmental rules, advising center operations, degree requirements, program of study planning, career options, and student organizations. Offered on a satisfactory-fail basis only.

**E E 185: Introduction to Electrical Engineering and Problem-Solving I**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or satisfactory scores on mathematics placement examinations); credit or concurrent enrollment in MATH 165*

Project based examples from electrical engineering. Systematic thinking process for engineering problem solving. Group problem solving. Mathematical, conceptual and computer based projects. Solving engineering problems and presenting solutions through technical reports and oral presentations. Solutions of engineering problems using computation tools and basic programming. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**E E 186: Introduction to Electrical Engineering and Problem Solving II**  
(0-2) Cr. 1. S.

*Prereq: E E 185*

Project based and hands on continuation of 185. Group skills needed to work effectively in teams. Individual interactive skills for small and large groups. Learning to use tools and methods for solving electrical engineering problems.

**E E 201: Electric Circuits**

(3-3) Cr. 4. F.S.

*Prereq: PHYS 231; 231L; credit or concurrent enrollment in MATH 267*

Emphasis on mathematical tools. Circuit elements (resistors, inductors, capacitors) and analysis methods including power and energy relationships. Network theorems. DC, sinusoidal steady-state, and transient analysis. AC power. Frequency response. Two port models. Diodes, PSpice. Laboratory instrumentation and experimentation. Credit for only E E 201 or 442 may be used towards graduation.

**E E 224: Signals and Systems I**

(3-3) Cr. 4. F.S.

*Prereq: E E 201; MATH 267*

Mathematical preliminaries. Introduction to signals and systems. Signal manipulations. System properties. LTI systems, impulse response and convolution. Fourier Series representation and properties. Continuous and discrete-time Fourier Transforms and properties. Sampling and reconstruction. Modulation and demodulation. Applications and demonstrations using Matlab.

**E E 230: Electronic Circuits and Systems**

(3-3) Cr. 4. F.S.

*Prereq: E E 201; MATH 267*

Frequency domain characterization of electronic circuits and systems, transfer functions, sinusoidal steady state response. Time domain models of linear and nonlinear electronic circuits, linearization, small signal analysis. Stability and feedback circuits. Operational amplifiers, device models, linear and nonlinear applications, transfer function realizations. A/D and D/A converters, sources of distortions, converter linearity and spectral characterization, applications. Design and laboratory instrumentation and measurements.

**E E 232: Professional and Ethical Issues in Electrical and Computer Engineering**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: COM S 227 or E E 285*

Professional and ethical issues in electrical and computer engineering. Soft skills, including communication and leadership skills, and how they relate to the engineering profession. Case studies illustrating ethical decision making in an engineering context and differentiating between moral and professional ethics. Issues of diversity, equity, and inclusion in the engineering profession.

**E E 261: Transfer Orientation**

(Cross-listed with CPR E). Cr. R.

Introduction to the College of Engineering and the engineering profession specifically for transfer students. Information concerning university and college policies, procedures, and resources. Offered on a satisfactory-fail basis only.

**E E 285: Problem Solving Methods and Tools for Electrical Engineering**  
(3-3) Cr. 4.

Integration of field-specific computational tools for practically solving electrical engineering problems. Methods for systematically reducing problems into sequential steps compatible with computer based tools. Structuring computer programs for efficiency and maintainability. Integration of multi-platform operating systems and multi-vendor tools for solving engineering problems. Hands-on laboratory experiences using Matlab, C, and other computational tools.

**E E 294: Program Discovery**

(Cross-listed with CPR E). Cr. R.

*Prereq: CPR E 166 or E E 166*

The roles of professionals in computer and electrical engineering. Relationship of coursework to industry and academic careers. Issues relevant to today's world. Offered on a satisfactory-fail basis only.

**E E 303: Energy Systems and Power Electronics**

(3-0) Cr. 3. F.S.

*Prereq: MATH 267; PHYS 232; credit or concurrent enrollment in E E 230*

Structure of competitive electric energy systems. System operation and economic optimization. Mutual inductance, transformers. Synchronous generators. Balanced three-phase circuit analysis and power calculations. Network calculations and associated numerical algorithms. Two-port circuits. Voltage regulation. Resonance and power factor correction. DC and induction motors. Power electronic circuit applications to power supplies and motor drives.

**E E 311: Electromagnetic Fields and Waves**

(4-0) Cr. 4. F.S.

*Prereq: E E 201; MATH 265; PHYS 232; credit or concurrent enrollment in MATH 267*

Fundamentals and applications of electric and magnetic fields and materials. Electrostatics and magnetostatics, potentials, capacitance and inductance, energy, force, torque. Uniform plane electromagnetic waves, Poynting vector. Transmission lines: transient and sinusoidal steady-state conditions, reflection coefficient.

**E E 314: Electromagnetics for non Electrical Engineers**

(3-0) Cr. 3.

*Prereq: PHYS 232 or equivalent*

Conceptual study of electromagnetism and its application in engineering and related fields. EM fundamentals, EM spectrum, radiation, radiating systems, wireless, modern concepts of physics, quantum computing, transmission lines, high speed effects, waveguides, GPS and other related phenomena will be discussed and explained with the application in mind.

**E E 321: Communication Systems I**

(3-0) Cr. 3. F.

*Prereq: E E 224*

Frequency domain analysis, spectral filtering, bandwidth. Linear modulation systems. Angle modulation systems. Phase locked loop, super-heterodyne receiver. Sampling and pulse code modulation. Digital data transmission, line coding, pulse shaping, multiplexing.

**E E 322: Probabilistic Methods for Electrical Engineers**

(Cross-listed with STAT). (3-0) Cr. 3. F.S.

*Prereq: E E 224*

Introduction to probability with applications to electrical engineers. Sets and events, probability space, conditional probability, total probability and Bayes' rule. Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, moments, moment generating function, multiple random variables, functions of random variables. Elements of statistics, hypothesis testing, confidence intervals, least squares. Introduction to random processes.

**E E 324: Signals and Systems II**

(3-3) Cr. 4. F.S.

*Prereq: E E 224*

Laplace and z-Transforms, properties and inverses. Applications to LTI systems, circuits, analog/digital filters, feedback systems, stability analysis and margins. MATLAB labwork covering these topics.

**E E 330: Integrated Electronics**

(Cross-listed with CPR E). (3-3) Cr. 4.

*Prereq: CPR E 281; E E 201; credit or concurrent enrollment in E E 230*

Semiconductor technology for integrated circuits. Modeling of integrated devices including diodes, BJTs, and MOSFETs. Physical layout. Circuit simulation. Digital building blocks and digital circuit synthesis. Analysis and design of analog building blocks. Laboratory exercises and design projects with CAD tools and standard cells.

**E E 332: Semiconductor Materials and Devices**

(Cross-listed with MAT E). (3-0) Cr. 3. S.

*Prereq: CPR E and E E majors: E E 230, MAT E majors: MAT E 317*

Introduction to semiconductor material and device physics. Quantum mechanics and band theory of semiconductors. Charge carrier distributions, generation/recombination, transport properties. Physical and electrical properties and fabrication of semiconductor devices such as MOSFETs, bipolar transistors, laser diodes and LED's.

**E E 333: Electronic Systems Design**

(3-3) Cr. 4. F.

*Prereq: CPR E 281; E E 230*

Further topics in electronic systems design: Use of sensors and actuators. High-power amplifying and switching components. Linear and switched-mode power supplies. Linear and switched-mode amplifiers.

Interfacing electronic components with programmable microcontrollers. Printed circuit board technology and design tools. Laboratory exercises and design projects incorporating printed circuit technology.

**E E 341: BioMEMs and Nanotechnology**

(Cross-listed with B M E). (3-0) Cr. 3.

*Prereq: B M E 220*

Overview of Micro-Electro-Mechanical-System (MEMS) technologies for bioengineering, fundamentals of microfluidic device design, fabrication, and characterization, survey of microfluidic functional building blocks for lab-on-a-chip applications including mixers, valves, channels, and chambers. Topics of nanotechnology in bioengineering, nanoscale building block technologies for bioengineering including self-assembling, surface chemical treatment, nano-imprinting, nano-particles, nano-tubes, nano-wires, and stimuli-responsive biomaterials.

**E E 341L: BioMEMS and Nanotechnology Laboratory**

(Cross-listed with B M E). (0-3) Cr. 1.

*Prereq: B M E 220; concurrent enrollment in B M E 341*

Introductory laboratory course accompanying B M E 341. Design, fabrication, and characterization of BioMEMS lab-on-a-chip devices and nanoscale techniques for bioengineering. Student group projects.

**E E 351: Analysis of Energy Systems**

(3-0) Cr. 3.

*Prereq: PHYS 232*

Energy-scientific, engineering and economic foundations. Energy utilization-global and national. Sectoral analysis of energy consumption. Relationship of energy consumption and production to economic growth and environment. Technology for energy production. Economic evaluation of energy utilization and production. Scientific basis for global warming. Environmental impact of energy production and utilization. Renewable energy.

Meets International Perspectives Requirement.

**E E 388: Sustainable Engineering and International Development**

(Cross-listed with A B E, C E). (2-2) Cr. 3. F.

*Prereq: Junior classification in an Engineering Major*

Multi-disciplinary approach to sustainable engineering and international development, sustainable development, appropriate design and engineering, feasibility analysis, international aid, business development, philosophy and politics of technology, and ethics in engineering.

Engineering-based projects from problem formulation through implementation. Interactions with partner community organizations or international partners such as nongovernment organizations (NGOs).

Course readings, final project/design report.

Meets International Perspectives Requirement.

**E E 391: Open Laboratory and Design Studio**

(2-2) Cr. 2.

*Prereq: E E 224*

Studio-based activity (guided problem-based learning and design) focusing on elements of design, measurement, data capture, and data interpretation. Team building, engineering professionalism, engineering process of review and critique, and presentation. Open design activities that may include working with other studios.

**E E 394: Program Exploration**

(Cross-listed with CPR E). Cr. R.

*Prereq: CPR E 294 or E E 294*

Exploration of academic and career fields for electrical and computer engineers. Examination of professionalism in the context of engineering and technology with competencies based skills. Introduction to professional portfolio development and construction. Offered on a satisfactory-fail basis only.

**E E 411: Wave Propagation and Transmission Lines**

(3-0) Cr. 3. S.

*Prereq: E E 311*

Time varying Maxwell's equations; wave equation in an unbounded generally lossy (multi-layered) media; uniform plane waves, dielectric constant, propagation, attenuation and phase constants; wave impedance; phase and group velocities; wave polarization; reflection and transmission coefficients (at oblique incidence) at boundaries (conducting and dielectric); Doppler effect; transmission lines; propagation, attenuation, phase constants; phase velocity; characteristic impedance; load impedance and its influence; reflection and transmission coefficients; cascaded transmission lines; steady-state voltage and current; standing waves; SWR; Smith chart; matching techniques including, quarter-wave matching, single and double stub matching.

**E E 414: Microwave Engineering**

(Dual-listed with E E 514). (3-3) Cr. 4. F.

*Prereq: E E 230, E E 311*

Principles, analyses, and instrumentation used in the microwave portion of the electromagnetic spectrum. Wave theory in relation to circuit parameters. S parameters, couplers, discontinuities, and microwave device equivalent circuits. RF amplifier design, microwave sources, optimum noise figure and maximum power designs. Microwave filters and oscillators.

**E E 417: Electromagnetic Radiation, Antennas, and Propagation**

(Dual-listed with E E 517). (3-3) Cr. 4. S.

*Prereq: E E 311*

Fundamental antenna concepts. Radiation from wire-and aperture-type sources. Radio transmission formulas. Wave and antenna polarization. Antenna arrays. Modern antenna topics. Practical antenna design. Antenna noise. Radiowave propagation in the presence of the earth and its atmosphere. Antenna measurements and computer aided analysis.

**E E 418: High Speed System Engineering Measurement and Testing**

(Cross-listed with CPR E). (3-2) Cr. 4. F.

*Prereq: E E 230 and E E 311*

Measurement of high speed systems and mixed signal systems. Measurement accuracy and error. Network analysis and spectrum analysis used in high speed measurement and testing. Test specification process and parametric measurement. Sampling and digital signal processing concepts. Design for testability. Testing equipment. Applications.

**E E 419: Magnetism and Magnetic Materials**

(Dual-listed with E E 519). (Cross-listed with MAT E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E E 311 or MAT E 317 or PHYS 364*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, magnetic measurements of properties for materials evaluation.



**E E 422: Communication Systems II**

(3-0) Cr. 3.

*Prereq: E E 321; E E 322; enrollment in E E 423*

Introduction to probability and random processes; Performance of analog systems with noise; Performance of digital communication with noise; optimum receivers, transmission impairments, and error rates; Introduction to information theory and coding: source coding, channel coding, channel capacity.

**E E 423: Communication Systems Laboratory**

(0-3) Cr. 1.

*Prereq: E E 321; enrollment in E E 422*

Construction and evaluation of modulators, demodulators and other components for analog and digital communications. Design, simulate, and evaluate wireless communication systems and their key components. Noise measurement.

**E E 424: Introduction to Digital Signal Processing**

(3-3) Cr. 4.

*Prereq: E E 224*

Sampling and reconstruction. Concepts and mathematical tools in discrete-time signal and image processing with examples from communications, nondestructive evaluation (NDE), and medical imaging. Discrete-time correlation and matched-filter receivers. Discrete Fourier transform (DFT) and its fast implementation (FFT). 2-dimensional versions. Z transforms. Filter design. Realizations of discrete-time systems and quantization effects. Laboratory experiments illustrating DSP implementations and applications.

**E E 425: Machine learning: A Signal Processing Perspective**

Cr. 3. S.

*Prereq: (E E 322 or STAT 322 or STAT 330); (MATH 207 or MATH 407 or MATH 507)*

Background material review (probability, calculus, linear algebra), Key machine learning tools and techniques. Supervised Learning: Linear Regression, Logistic Regression, Generative algorithms for classification (Gaussian & discrete-valued case; Naive Bayes assumption), Support Vector Machines, Decision trees; Unsupervised Learning: principal components analysis (PCA), robust PCA, clustering; Introduction to Deep Learning and Neural Networks; Basic Learning Theory and Bias-Variance Tradeoff; introduction to key Bayesian estimation concepts (MMSE estimation, Kalman filter, hidden Markov models).

**E E 432: Microelectronics Fabrication Techniques**

(Dual-listed with E E 532). (Cross-listed with MAT E). (2-4) Cr. 4.

*Prereq: CPR E and E E majors: E E 230; MAT E majors: MAT E 317*

Techniques used in modern integrated circuit fabrication, including diffusion, oxidation, ion implantation, lithography, evaporation, sputtering, chemical-vapor deposition, and etching. Process integration. Process evaluation and final device testing. Extensive laboratory exercises utilizing fabrication methods to build electronic devices. Use of computer simulation tools for predicting processing outcomes. Recent advances in processing CMOS ICs and micro-electro-mechanical systems (MEMS).

**E E 435: Analog VLSI Circuit Design**

(Cross-listed with CPR E). (3-3) Cr. 4. S.

*Prereq: E E 330*

Basic analog integrated circuit and system design including design space exploration, performance enhancement strategies, operational amplifiers, references, integrated filters, and data converters.

**E E 436: Physics of Transistors**

Cr. 3. S.

*Prereq: E E 332*

Use of energy band diagrams to describe the behavior of junction devices, electron and hole currents in transistors, junction capacitance, parasitic and second-order effects, development of circuit models from the underlying physical behavior, heterojunction devices, high-speed and high-power applications, measurement techniques.

**E E 437: Electronic Properties of Materials**

(Dual-listed with E E 537). (Cross-listed with MAT E). Cr. 3. S.

*Prereq: E E 332 or MAT E 317 or PHYS 322*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, biomedical applications of magnetism, magnetic evaluation of materials.

**E E 438: Optoelectronic Devices and Applications**

(Dual-listed with E E 538). (3-0) Cr. 3.

*Prereq: E E 311, E E 332*

Transmission and reflection of electromagnetic plane waves. Propagation in dielectric and fiber optic waveguides. LED and laser operating principles and applications. Photodetectors and solar cells. Optical modulation and switching.

**E E 439: Nanoelectronics**

(3-0) Cr. 3. S.

*Prereq: E E 332 or MAT E 334*

Concepts of quantum mechanics relevant to nanoelectronic devices, including quantization, tunneling, and transport; overview of some of the leading technologies for nanoelectronics, including carbon nanotubes, quantum dots, and molecular transistors; fabrication methods for building nanoelectronic devices.

**E E 442: Introduction to Circuits and Instruments**

(3-2) Cr. 2. F.S.

*Prereq: MATH 267; PHYS 232; PHYS 232L*

Half-semester course. Basic circuit analysis using network theorems with time domain and Laplace transform techniques for resistive, resistive-inductive, resistive-capacitive, and resistive-inductive-capacitive circuits. Transient circuit behavior. Basic operational amplifiers and applications. Familiarization with common E E instrumentation and demonstration of basic principles. Credit for only 201 or 442 may be counted toward graduation; credit for 442 will not count toward graduation for E E or Cpr E majors.

**E E 448: Introduction to AC Circuits and Motors**

(3-2) Cr. 2. F.S.

*Prereq: E E 442*

Half-semester course. Basics of DC machines, stepper motors, AC induction motors, and synchronous generators. AC steady state analysis, transformers, and three-phase circuit analysis.

**E E 450: Biosensors**

(Cross-listed with B M E). (3-0) Cr. 3.

*Prereq: B M E 220*

Overview of biosensors and bioanalytical challenges; designing for performance including various analytical problems, ion-selective membranes, characteristics of enzymes and basics of bioaffinity sensing; fundamentals of bioselective layers including depositing films and membranes, surfaces for immobilization and bioselective agents; survey of different biosensing technologies including electroanalytical, biomembrane, optical, and acoustic-wave based sensors.

**E E 450L: Biosensors Laboratory**

(Cross-listed with B M E). (0-3) Cr. 1.

*Prereq: B M E 220; concurrent enrollment in B M E 450 or E E 450*

Laboratory course accompanying B M E 450. Design, fabrication, and characterization of various electrical, chemical, polymer, optical and acoustic sensors.

**E E 451: Engineering Acoustics**

(Cross-listed with E M, M E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: (MATH 266 or MATH 267); PHYS 231; PHYS 231L*

The basics of acoustic wave propagation in fluids with an emphasis on sound propagation in air. Topics include transmission and reflection of sound at a boundary; role of acoustic sources in directing sound fields; diffraction of sound around solid objects; reverberation of sound in a room; and the measurement of sound fields.

**E E 452: Electrical Machines and Power Electronic Drives**

(2-3) Cr. 3. S.

*Prereq: E E 303; E E 324*

Basic concepts of electromagnetic energy conversion. DC motors and three-phase induction motors. Basic introduction to power electronics. Adjustable speed drives used for control of DC, induction, and AC motors. Experiments with converter topologies, DC motors, AC motors and adjustable speed drives.

**E E 455: Introduction to Energy Distribution Systems**

(3-0) Cr. 3. F.

*Prereq: E E 303; credit or concurrent enrollment in E E 324*

Overhead and underground distribution system descriptions and characteristics, load descriptions and characteristics, overhead line and underground cable models, distribution transformers, power flow and fault analysis, overcurrent protection, power factor correction, system planning and automation, and economics in a deregulated environment.

**E E 456: Power System Analysis I**

(3-0) Cr. 3. F.

*Prereq: E E 303; credit or concurrent enrollment in E E 324*

Power transmission lines and transformers, synchronous machine modeling, network analysis, power system representation, load flow.

**E E 457: Power System Analysis II**

(3-0) Cr. 3. S.

*Prereq: E E 303; credit or concurrent enrollment in E E 324*

Power system protection, symmetrical components, faults, stability. Power system operations including the new utility environment.

**E E 458: Economic Systems for Electric Power Planning**

(3-0) Cr. 3.

*Prereq: E E 303 or ECON 301*

Evolution of electric power industry. Power system operation and planning and related information systems. Linear and integer optimization methods. Short-term electricity markets and locational marginal prices. Risk management and financial derivatives. Basics of public good economics. Cost recovery models including tax treatment for transmission investments.

**E E 459: Electromechanical Wind Energy Conversion and Grid Integration**

(Dual-listed with E E 559). (3-0) Cr. 3.

*Prereq: Credit or enrollment in E E 452, E E 456*

Summary of industry status and expected growth; power extraction from the air stream; operation and modeling of electric machines, and power electronics topologies for wind energy conversion; analysis of machine-grid power electronic circuits, controller interface, and collector (distribution) networks; treatment of harmonics, flicker, over/under-voltages, filters, low-voltage ride-through, and reactive compensation; relaying; effects on transmission expansion, planning and grid operation and coordination including variability, frequency control, reserves, and electricity markets; overview of storage technologies and hybrid configurations.

**E E 465: Digital VLSI Design**

(Cross-listed with CPR E). (3-3) Cr. 4. F.

*Prereq: E E 330*

Digital design of integrated circuits employing very large scale integration (VLSI) methodologies. Technology considerations in design. High level hardware design languages, CMOS logic design styles, area-energy-delay design space characterization, datapath blocks: arithmetic and memory, architectures and systems on a chip (SOC) considerations. VLSI chip hardware design project.

**E E 475: Automatic Control Systems**

(3-0) Cr. 3. F.

*Prereq: E E 324*

Stability and performance analysis of automatic control systems. The state space, root locus, and frequency response methods for control systems design. PID control and lead-lag compensation. Computer tools for control system analysis and design.

**E E 476: Control System Simulation**

(2-3) Cr. 3. S.

*Prereq: E E 475*

Theory and practice of linear, nonlinear, and logic control systems, with hands-on labs on Modeling and Control of: Motor (model identification and validation, speed and position control using PID), Double-hinged inverted pendulum (model identification and validation, balance control using linearization and state-feedback, and swing-up control using sliding-mode), Quadcopter (model identification and validation, navigation and obstacle avoidance control using PID), PLC Assembly-line (ladder logic control for start/stop, sorting, assembly, and discharge using constructs of XIC/XIO/Timer/Counter/OSF/FIFO).

**E E 488: Eddy Current Nondestructive Evaluation**

(Dual-listed with E E 588). (Cross-listed with MAT E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 265 and (MAT E 216 or MAT E 273 or MAT E 392 or E E 311 or PHYS 364)*

Electromagnetic fields of various eddy current probes. Probe field interaction with conductors, cracks and other material defects. Ferromagnetic materials. Layered conductors. Elementary inversion of probe signals to characterize defects. Special techniques including remote-field, transient, potential drop nondestructive evaluation and the use of Hall sensors. Practical assignments using a 'virtual' eddy current instrument will demonstrate key concepts.

**E E 489: Survey of Remote Sensing Technologies**

(Dual-listed with E E 589). (Cross-listed with ENSCI, GEOL, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**E E 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with E E 589L). (Cross-listed with GEOL, MTEOR, NREM). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar).

Provides practical applications in an environmental context.

**E E 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Senior classification in Electrical Engineering; Permission of Department*

Investigation of an approved topic commensurate with the student's prerequisites.

**E E 490H: Independent Study: Honors**

Cr. arr.

*Prereq: Senior classification in Electrical Engineering; Permission of Department*

Investigation of an approved topic commensurate with the student's prerequisites.

**E E 491: Senior Design Project I and Professionalism**

(Cross-listed with CPR E, S E). (2-3) Cr. 3. F.S.

*Prereq: CPR E major: CPR E 232, cr or enrollment in CPR E 308, completion of 29 cr in the CPRE prof prog, ENGL 314. E E major: E E 232, cr or enrollment in E E 322, completion of 24 cr in the EE prof prog, ENGL 314. S E major: S E 317 and S E 339, ENGL 309 or ENGL 314. Co-req: CPR E 308 or COM S 352*

Preparing for entry to the workplace. Selected professional topics. Use of technical writing skills in developing project plan and design report; design review presentation. First of two-semester team-oriented, project design and implementation experience.

**E E 492: Senior Design Project II**

(Cross-listed with CPR E, S E). (1-3) Cr. 2. F.S.

*Prereq: CPR E 491 or E E 491 or S E 491*

Second semester of a team design project experience. Emphasis on the successful implementation and demonstration of the design completed in E E 491, Cpr E 491, or S E 491 and the evaluation of project results.

Technical writing of final project report; oral presentation of project achievements; project poster.

**E E 494: Portfolio Assessment**

(Cross-listed with CPR E). Cr. R.

*Prereq: CPR E 232 or E E 232 or CYB E 234; credit or concurrent enrollment in CPR E 491 or E E 491*

Portfolio update and evaluation. Portfolios as a tool to enhance career opportunities.

**E E 496: Modern Optics**

(Cross-listed with PHYS). (3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (PHYS 322; PHYS 365; PHYS 480)*

Review of wave and electromagnetic theory; topics selected from: reflection/refraction, interference, geometrical optics, Fourier analysis, dispersion, coherence, Fraunhofer and Fresnel diffraction, holography, quantum optics, nonlinear optics.

**Courses primarily for graduate students, open to qualified undergraduates:**

**E E 501: Analog and Mixed-Signal VLSI Circuit Design Techniques**

(3-3) Cr. 4. F.

*Prereq: E E 435*

Design techniques for analog and mixed-signal VLSI circuits. Amplifiers; operational amplifiers, transconductance amplifiers, finite gain amplifiers and current amplifiers. Linear building blocks; differential amplifiers, current mirrors, references, cascading and buffering. Performance characterization of linear integrated circuits; offset, noise, sensitivity and stability. Layout considerations, simulation, yield and modeling for high-performance linear integrated circuits.

**E E 503: Power Management Integrated Circuits**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E E 435, or Credit or Registration for E E 501*

Introducing in-depth chip-level power management integrated circuit (PMIC) designs, including switching power converters, linear regulators, charge pumps and other types of PMICs. Steady-state and dynamic response analysis and optimization of linear regulators and switching power converters with different control methodologies, such as voltage-/current-/band-band control. Chip-level circuit design considerations, optimizations and cadence simulations for PMICs, including system and block-level circuits, such as voltage reference, current source and current mirror, current sensor, ramp generator, non-overlapping power stage, and other circuits.

**E E 505: CMOS and BiCMOS Data Conversion Circuits**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq: E E 501*

Theory, design and applications of data conversion circuits (A/D and D/A converters) including: architectures, characterization, quantization effects, conversion algorithms, spectral performance, element matching, design for yield, and practical comparators, implementation issues.

**E E 506: Design of CMOS Phase-Locked Loops**

(3-3) Cr. 4.

*Prereq: E E 435 or E E 501 or instructor approval*

Analysis and design of phase-locked loops implemented in modern CMOS processes including: architectures, performance metrics, and characterization; noise and stability analysis; and design issues of phase-frequency detectors, charge pumps, loop filters (passive and active), voltage controlled oscillators, and frequency dividers.

**E E 507: VLSI Communication Circuits**

(3-3) Cr. 4. Alt. S., offered odd-numbered years.

*Prereq: E E 435 or E E 501*

Phase-locked loops, frequency synthesizers, clock and data recovery circuits, theory and implementation of adaptive filters, low-noise amplifiers, mixers, power amplifiers, transmitter and receiver architectures.

**E E 508: Filter Design and Applications**

(3-3) Cr. 4.

*Prereq: E E 501*

Filter design concepts. Approximation and synthesis. Transformations. Continuous-time and discrete time filters. Discrete, active and integrated synthesis techniques.

**E E 509: Mixed-Signal IC Testing and Built In Self Test**

(3-0) Cr. 3.

*Prereq: E E 424 or equivalent and E E 435 or E E 501*

Introduction to mixed-signal IC testing; measurement uncertainty and test validity; IEEE standard test algorithms; high performance test and built-in self test challenges; new mixed-signal test algorithms and techniques to reduce data acquisition to relax instrumentation requirements, to simplify test setup, to improve test validity, and/or to enable co-testing of heterogeneous functions.

**E E 510: Topics in Electromagnetics**

Cr. 1-3. Repeatable.

*Prereq: E E 311***E E 512: Advanced Electromagnetic Field Theory I**

(3-0) Cr. 3. F.

*Prereq: E E 311*

Review of static electric and magnetic fields. Maxwell's equations. Circuit concepts and impedance elements. Propagation and reflection of plane waves in isotropic media. Guided electromagnetic wave. Characteristics of common waveguides and transmission lines. Propagation in anisotropic media. Special theorems and concepts. Radiation and scattering.

**E E 513: Advanced Electromagnetic Field Theory II**

(3-0) Cr. 3. S.

*Prereq: E E 512*

Green's functions, perturbational and variational techniques. Analysis of microstrip lines and interconnects. Spectral domain approach, waves in layered media. Integral equations and method of moments. Inverse scattering. Electromagnetic applications.

**E E 514: Microwave Engineering**

(Dual-listed with E E 414). (3-3) Cr. 4. F.

*Prereq: E E 230, E E 311*

Principles, analyses, and instrumentation used in the microwave portion of the electromagnetic spectrum. Wave theory in relation to circuit parameters. S parameters, couplers, discontinuities, and microwave device equivalent circuits. RF amplifier design, microwave sources, optimum noise figure and maximum power designs. Microwave filters and oscillators.

**E E 516: Computational Methods in Electromagnetics**

(3-0) Cr. 3. S.

*Prereq: E E 311*

Maxwell's equations. Differential equation based methods. Finite difference and finite difference time domain methods, boundary conditions. Finite element method and applications to the analysis of practical devices. Integral equation based methods. Electric and magnetic field integral equations. Matrix solvers. Fast solution methods.

**E E 517: Electromagnetic Radiation, Antennas, and Propagation**

(Dual-listed with E E 417). (3-3) Cr. 4. S.

*Prereq: E E 311*

Fundamental antenna concepts. Radiation from wire-and aperture-type sources. Radio transmission formulas. Wave and antenna polarization. Antenna arrays. Modern antenna topics. Practical antenna design. Antenna noise. Radiowave propagation in the presence of the earth and its atmosphere. Antenna measurements and computer aided analysis.

**E E 518: Microwave Remote Sensing**

(Cross-listed with AGRON, MTEOR). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Math 265*

Microwave remote sensing of Earth's surface and atmosphere using satellite-based or ground-based instruments. Specific examples include remote sensing of atmospheric temperature and water vapor, precipitation, ocean salinity, and soil moisture.

**E E 519: Magnetism and Magnetic Materials**

(Dual-listed with E E 419). (Cross-listed with M S E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E E 311 or MAT E 317 or PHYS 364*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, magnetic measurements of properties for materials evaluation.

**E E 521: Advanced Communications**

(3-0) Cr. 3. F.

*Prereq: E E 422, credit or enrollment in E E 523*

Digital communication systems overview. Characterization of communication channels. Digital modulation and demodulation design and performance analysis. Channel capacity and error-control coding concepts. Waveform design for band-limited channels. Equalization. Wireless fading channels and performance.

**E E 522: Cognitive Radio Networks**

(Cross-listed with CPR E). (3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: Permission of instructor*

Topics on cognitive radio networks: Cognitive Radio Networks Architecture; Software Defined Radio Architecture; Spectrum Sensing; Spectrum Management; Spectrum Sharing; Spectrum Mobility; Applications of Cognitive Radio Networks.

**E E 523: Random Processes for Communications and Signal Processing**  
(3-0) Cr. 3.

*Prereq: E E 322, MATH 317*

Axioms of probability; Repeated trials; Functions of a random variable and multiple random variables: covariance matrix, conditional distribution, joint distribution, moments, and joint moment generating function; Mean square estimation; stochastic convergence; Some important stochastic processes: Random walk, Poisson, Wiener, and shot noise; Markov chains; Power spectral analysis; Selected applications.

**E E 524: Digital Signal Processing**

(3-0) Cr. 3. F.

*Prereq: E E 322, E E 424, MATH 317*

Review: sampling and reconstruction of signals; discrete-time signals, systems, and transforms. Multi-rate digital signal processing and introduction to filter banks. Optimal linear filtering and prediction. Introductions to adaptive filtering and spectral estimation. Applications.

**E E 526: Deep Learning: Theory and Practice**

Cr. 3.

*Prereq: MATH 207, E E 322*

Review of basic theoretic tools such as linear algebra and probability. Machine learning basics will then be introduced to motivate deep learning networks. Different deep learning network architectures will be studied in detail, including their training and implementations. Applications and research problems will also be surveyed at the end of the class.

**E E 527: Detection and Estimation Theory**

(3-0) Cr. 3. S.

*Prereq: E E 422*

Statistical estimation theory and performance measures: maximum likelihood estimation, Cramer-Rao bound, Bayesian estimation, optimal demodulation, signal design. Introduction to graphical models. Hidden Markov models and Kalman filter. Classical statistical decision theory, decision criteria, binary and composite hypothesis tests. Error probability and Chernoff bound. Applications.

**E E 529: Data Analytics in Electrical and Computer Engineering**

(Cross-listed with CPR E). (3-0) Cr. 3. S.

*Prereq: E E 322 or equivalent*

Introduces a variety of data analytics techniques # particularly those relevant for electrical and computer engineers # from a foundational perspective. Topics to be covered include techniques for classification, visualization, and parameter estimation, with applications to signals, images, matrices, and graphs. Emphasis will be placed on rigorous analysis as well as principled design of such techniques.

**E E 531: Micro and Nano Systems and Devices**

Cr. 3.

*Prereq: E E 332; E E 432 or E E 532*

Fundamentals of modeling and design of micro-nanosystems and devices based on various operational mechanisms. Significant hands-on experience using commercial software COMSOL to design and model micro-nanosystems and devices for biomedical and biomedicine applications among others. Experimental hands-on experience to operate the fabricated micro-nanosystems and devices in the instructor's research lab.

**E E 532: Microelectronics Fabrication Techniques**

(Dual-listed with E E 432). (Cross-listed with M S E). (2-4) Cr. 4.

*Prereq: CPR E and E E majors: E E 230; MAT E majors: MAT E 317*

Techniques used in modern integrated circuit fabrication, including diffusion, oxidation, ion implantation, lithography, evaporation, sputtering, chemical-vapor deposition, and etching. Process integration. Process evaluation and final device testing. Extensive laboratory exercises utilizing fabrication methods to build electronic devices. Use of computer simulation tools for predicting processing outcomes. Recent advances in processing CMOS ICs and micro-electro-mechanical systems (MEMS).

**E E 535: Physics of Semiconductors**

(Cross-listed with PHYS). (3-3) Cr. 4.

*Prereq: E E 311 and E E 332*

Basic elements of quantum theory, Fermi statistics, motion of electrons in periodic structures, crystal structure, energy bands, equilibrium carrier concentration and doping, excess carriers and recombination, carrier transport at low and high fields, space charge limited current, photo-conductivity in solids, phonons, optical properties, amorphous semiconductors, heterostructures, and surface effects. Laboratory experiments on optical properties, carrier lifetimes, mobility, defect density, doping density, photo-conductivity, diffusion length of carriers.

**E E 536: Physics of Semiconductor Devices**

(Cross-listed with PHYS). (3-0) Cr. 3.

*Prereq: E E 535*

P-n junctions, band-bending theory, tunneling phenomena, Schottky barriers, heterojunctions, bipolar transistors, field-effect transistors, negative-resistance devices and optoelectronic devices.



**E E 537: Electronic Properties of Materials**

(Dual-listed with E E 437). (Cross-listed with M S E). Cr. 3. S.

*Prereq: E E 332 or MAT E 317 or PHYS 322*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, biomedical applications of magnetism, magnetic evaluation of materials.

**E E 538: Optoelectronic Devices and Applications**

(Dual-listed with E E 438). (3-0) Cr. 3.

*Prereq: E E 311, E E 332*

Transmission and reflection of electromagnetic plane waves. Propagation in dielectric and fiber optic waveguides. LED and laser operating principles and applications. Photodetectors and solar cells. Optical modulation and switching.

**E E 552: Energy System Planning**

(3-0) Cr. 3.

*Prereq: E E 456, E E 457 or equivalent*

Characteristics of bulk energy conversion, storage, and transport technologies. Environmental legislation. Modeling of electricity markets. Evaluation of sustainability and resiliency. Types of planning analyses: economic, multi-sector, long-term, national. Planning tools and associated optimization methods.

**E E 553: Steady State Analysis**

(3-0) Cr. 3. F.

*Prereq: E E 456, E E 457*

Power flow, economic dispatch, unit commitment, electricity markets, automatic generation control, sparse matrix techniques, interconnected operation, voltage control.

**E E 554: Power System Dynamics**

(3-0) Cr. 3. S.

*Prereq: E E 456, E E 457, E E 475*

Dynamic performance of power systems with emphasis on stability. Modeling of system components and control equipment. Analysis of the dynamic behavior of the system in response to small and large disturbances.

**E E 555: Advanced Energy Distribution Systems**

(3-0) Cr. 3.

*Prereq: E E 455*

Transient models of distribution components, automated system planning and distribution automation, surge protection, reliability, power quality, power electronics and intelligent systems applications.

**E E 556: Power Electronic Systems**

(3-0) Cr. 3.

*Prereq: E E 452*

Converter topologies, AC/DC, DC/DC, DC/AC, AC/AC. Converter applications to do motor drives, power supplies, AC motor drives, power system utility applications (var compensators) and power quality.

**E E 559: Electromechanical Wind Energy Conversion and Grid Integration**

(Dual-listed with E E 459). (3-0) Cr. 3.

*Prereq: Credit or enrollment in E E 452, E E 456*

Summary of industry status and expected growth; power extraction from the air stream; operation and modeling of electric machines, and power electronics topologies for wind energy conversion; analysis of machine-grid power electronic circuits, controller interface, and collector (distribution) networks; treatment of harmonics, flicker, over/under-voltages, filters, low-voltage ride-through, and reactive compensation; relaying; effects on transmission expansion, planning and grid operation and coordination including variability, frequency control, reserves, and electricity markets; overview of storage technologies and hybrid configurations.

**E E 565: Systems Engineering and Analysis**

(Cross-listed with AER E, I E). (3-0) Cr. 3.

*Prereq: Coursework in basic statistics*

Introduction to organized multidisciplinary approach to designing and developing systems. Concepts, principles, and practice of systems engineering as applied to large integrated systems. Life-cycle costing, scheduling, risk management, functional analysis, conceptual and detail design, test, evaluation and systems engineering planning and organization. Not available for degrees in industrial engineering.

**E E 566: Avionics Systems Engineering**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: E E 565*

Avionics functions. Applications of systems engineering principles to avionics. Top down design of avionics systems. Automated design tools.

**E E 570: Systems Engineering Analysis and Design**

(3-0) Cr. 3.

*Prereq: E E 475, E E 577*

Selected topics in abstract algebra, linear algebra, real analysis, functional analysis, and optimization methods in electrical engineering.

**E E 571: Introduction to Convex Optimization**

(3-0) Cr. 3.

Introduction to convex optimization problems emerging in electrical engineering. Efficiently solving convex optimization problems with the use of interior point algorithms software. Review of linear algebra, convex functions, convex sets, convex optimization problems, duality, disciplined convex programming, applications to optimal filtering, estimation, control and resources allocations, sensor network, distributed systems.

**E E 573: Random Signal Analysis and Kalman Filtering**

(Cross-listed with AER E, M E). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or M E 370 or M E 411 or MATH 341*

Elementary notions of probability. Random processes. Autocorrelation and spectral functions. Estimation of spectrum from finite data. Response of linear systems to random inputs. Discrete and continuous Kalman filter theory and applications. Smoothing and prediction. Linearization of nonlinear dynamics.

**E E 574: Optimal Control**

(Cross-listed with AER E, M E). (3-0) Cr. 3. S.

*Prereq: E E 577*

The optimal control problem. Variational approach. Pontryagin's principle, Hamilton-Jacobi equation. Dynamic programming. Time-optimal, minimum fuel, minimum energy control systems. The regulator problem. Structures and properties of optimal controls.

**E E 575: Introduction to Robust Control**

(Cross-listed with AER E, M E). (3-0) Cr. 3.

*Prereq: E E 577*

Introduction to modern robust control. Model and signal uncertainty in control systems. Uncertainty description. Stability and performance robustness to uncertainty. Solutions to the H<sub>2</sub>, H<sub>∞</sub>, and L<sub>1</sub> control problems. Tools for robustness analysis and synthesis.

**E E 576: Digital Feedback Control Systems**

(Cross-listed with AER E, M E). (3-0) Cr. 3. F.

*Prereq: E E 475 or AER E 432 or M E 411 or MATH 415; and MATH 267*

Sampled data, discrete data, and the z-transform. Design of digital control systems using transform methods: root locus, frequency response and direct design methods. Design using state-space methods. Controllability, observability, pole placement, state estimators. Digital filters in control systems. Microcomputer implementation of digital filters. Finite wordlength effects. Linear quadratic optimal control in digital control systems. Simulation of digital control systems.

**E E 577: Linear Systems**

(Cross-listed with AER E, M E, MATH). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or MATH 415; and MATH 207*

Linear algebra review. Least square method and singular value decomposition. State space modeling of linear continuous-time systems. Solution of linear systems. Controllability and observability. Canonical description of linear equations. Stability of linear systems. State feedback and pole placements. Observer design for linear systems.

**E E 578: Nonlinear Systems**

(Cross-listed with AER E, M E, MATH). (3-0) Cr. 3. S.

*Prereq: E E 577*

Linear vs nonlinear systems. Phase plane analysis. Bifurcation and center manifold theory. Lyapunov stability. Absolute stability of feedback systems. Input-output stability. Passivity theory and feedback linearization. Nonlinear control design techniques.

**E E 588: Eddy Current Nondestructive Evaluation**

(Dual-listed with E E 488). (Cross-listed with M S E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 265 and (MAT E 216 or MAT E 273 or MAT E 392 or E E 311 or PHYS 364)*

Electromagnetic fields of various eddy current probes. Probe field interaction with conductors, cracks and other material defects. Ferromagnetic materials. Layered conductors. Elementary inversion of probe signals to characterize defects. Special techniques including remote-field, transient, potential drop nondestructive evaluation and the use of Hall sensors. Practical assignments using a 'virtual' eddy current instrument will demonstrate key concepts.

**E E 589: Survey of Remote Sensing Technologies**

(Dual-listed with E E 489). (Cross-listed with ENSCI, GEOL, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**E E 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with E E 489L). (Cross-listed with GEOL, MTEOR, NREM). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**E E 590: Special Topics**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590A: Special Topics: Electromagnetic Theory**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590B: Special Topics: Control Systems**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590C: Special Topics: Communication Systems**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590E: Special Topics: Computer Engineering**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590F: Special Topics: Electric Power**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590G: Special Topics: Electrical Materials**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590H: Special Topics: Electronic Devices and Circuits**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 590I: Special Topics: Signal Processing**

Cr. 1-6. Repeatable.

Formulation and solution of theoretical or practical problems in electrical engineering.

**E E 592: Seminar in Electrical Engineering**

(1-0) Cr. 1-4. Repeatable, maximum of 8 times. F.S.

Technical seminar presentations on topics in various areas in electrical engineering. It will have the following sections, corresponding to graduate study areas in the department: Bioengineering; Communications, signal processing, and machine learning; Electric power and energy systems; Electromagnetic, microwave, and nondestructive evaluation; Microelectronics and photonics; Systems and controls; and VLSI. Offered on a satisfactory-fail basis only.

**E E 595: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

Investigation of an approved topic commensurate with the student's prerequisites.

**E E 598: Electrical and Computer Engineering Learning Community Seminar**

(Cross-listed with CPR E). Cr. R. F.S.

*Prereq: Electrical and Computer Engineering Graduate Student*

Introduction to graduate study in Electrical and Computer Engineering at Iowa State University. Building networks, introduction to core requirements, and tools and techniques for success. Offered on a satisfactory-fail basis only. ECpE

**E E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:****E E 617: Advanced Topics in Antenna Analysis and Design**

(3-0) Cr. 3. F.

*Prereq: E E 417 or E E 517*

Introduction to several advanced topics related to antenna design, analysis, and fabrication; beyond what is covered in E E 417 or E E 517 which primarily addresses fundamental foundations of antenna theory, analysis, and design. Topics include: Radiation integrals and methods; Polarization, in a comprehensive manner; antenna synthesis and continuous sources; Integral equations, self and mutual impedances, and vector effective length; Aperture antennas and field calculation fundamentals; Near-field to far-field transformation; Microstrip antennas; and Reconfigurable antenna fundamentals. Assignments will involve the use of numerical electromagnetic solvers such as HFSS and CST Microwave Studio. Expands skill sets in the area of numerical EM analysis, which is a critical issue for practical and advanced antenna design problems.

**E E 621: Coding Theory**

(3-0) Cr. 3.

*Prereq: E E 521*

Fundamentals of error-control coding techniques: coding gain, linear block codes. Galois fields. Cyclic codes: BCH, Reed-Solomon. Convolutional codes and the Viterbi algorithm. Trellis-coded modulation. Iterative decoding. Recent developments in coding theory.

**E E 622: Information Theory**

(3-0) Cr. 3.

*Prereq: E E 521, E E 523*

Information system overview. Entropy and mutual information. Data Compression and source encoding. Discrete memoryless channel capacity. Noisy channel coding theorem. Rate distortion theory. Waveform channels. Advanced topics in information theory.

**E E 653: Advanced Topics in Electric Power System Engineering**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Advanced topics of current interest in electric power system engineering.

**E E 674: Advanced Topics in Systems Engineering**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Advanced topics of current interest in the areas of control theory, stochastic processes, digital signal processing, and image processing.

**E E 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with AGRON, BCB, ENGR, GENET, M E). (3-0) Cr. 1.

Repeatable, maximum of 2 credits. F.S.

*Prereq: Graduate student status and completion of at least one semester of graduate coursework.*

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**E E 697: Engineering Internship**

(Cross-listed with CPR E). Cr. R. Repeatable.

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**E E 699: Research**

Cr. arr. Repeatable.

## Engineering (ENGR)

*Any experimental courses offered by ENGR can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****ENGR 101: Engineering Orientation**

Cr. R. F.S.

Introduction to the College of Engineering and the engineering profession. Information concerning university and college policies, procedures, and resources. Undeclared sections: Considerations in choosing an engineering curriculum. Opportunities to interact with departments. Declared sections: Introduction to major-specific topics. Offered on a satisfactory-fail basis only.

**ENGR 104: LEAD Program Orientation**

(1-0) Cr. 1. F.

Orientation for LEAD Learning/Living Community participants.

Introduction to college and university resources, tools and techniques to promote academic, professional and social/cultural development and success. Focus on building support networks with peers, faculty, and staff. Introduction to core engineering competencies including but not limited to initiative, communication, teamwork, and cultural adaptability. Offered on a satisfactory-fail basis only.

**ENGR 105: LEAD Program Seminar**

(1-0) Cr. 1. S.

Seminar for LEAD Learning/Living Community participants. Focus on professional development and exposure to various engineering disciplines through hands-on lab experiences, industry visits and networking opportunities with alumni, faculty, and staff. Development of core competencies: engineering/technical knowledge, communication and teamwork. Offered on a satisfactory-fail basis only.

**ENGR 131: Learning Community Seminar**

Cr. R. F.

Peer-mentored review of course topics in engineering undeclared learning communities. Offered on a satisfactory-fail basis only.

**ENGR 150: Foundations of Leadership Development and Learning**

(1-0) Cr. 1. F.S.

*Prereq: ELP students only*

Leadership development with focus on global context and awareness of events shaping the context. Exposure to theory of leadership with examples. Necessary characteristics of a leader, and strategies for leadership skills development. Exposure to non-traditional career paths for engineers. Outline of personalized leadership development. Offered on a satisfactory-fail basis only.

**ENGR 160: Engineering Problems with Computer Applications Laboratory**

(2-2) Cr. 3. F.S.SS.

*Prereq: MATH 143 or satisfactory scores on mathematics placement examinations*

Solving engineering problems and presenting solutions through technical reports. Significant figures. Use of SI units. Graphing and curve-fitting. Flowcharting. Introduction to mechanics, statistics and engineering economics. Use of spreadsheet programs to solve and present engineering problems. Solution of engineering problems using computer programming languages. (The honors section includes application of programming to mobile robotics). Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**ENGR 203: Engineering Career and Employment Preparation**

(1-0) Cr. 1. F.S.SS.

Development of practical career knowledge and skills such as understanding employers of engineers, determining career goals, identifying employers of interest, developing effective application materials, applying for positions, networking, interviewing, and evaluating offers. Overview of professional resources and tools available to aid in the employment process. Offered on a satisfactory-fail basis only.

**ENGR 250: Leadership in Engineering Teams**

(1-0) Cr. 1. F.S.

Building and sustaining decision-making engineering teams. Students will explore the interrelated processes of discerning purpose, thinking systemically, developing reflective judgment, and exercising leadership by mobilizing and setting the direction for adaptive change within a team. Industry based examples and information from engineering and natural resource sciences will be infused into the course.

**ENGR 265: Survey of the Impacts of Engineering Activity**

(3-0) Cr. 3. F.S.

Survey of the economic, environmental, societal, and political benefits and problems resulting from engineering activity. Effects of engineering projects on human health, social structures, and the environment. Examination of improvements in economic opportunities and quality of life resulting from engineering activity. Case studies of the effects of engineering activity.

**ENGR 320: International Experience Report**

Cr. 3. F.S.

*Prereq: Satisfactory completion of international work experience of at least ten weeks or nine credits of approved course work taken abroad. Permission of student's department prior to departure*

Critique of work/study abroad experience as it relates to professional development. Taken the semester after completion of work abroad or study abroad. Written report and presentation. Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

**ENGR 327: Voices of Public Policy**

(3-0) Cr. 3. F.

*Prereq: Sophomore or higher classification; Major in Engineering*

Role and impact of legislative process, partisan politics, government, lobbyists, the media, expert testimony and grassroots activism on public policy. Critical analysis of context; of claims, assumptions, premises, and evidence of both sides; represented and disenfranchised populations; the ethical issues to develop personal position and courses of action to impact public policy process.

**ENGR 350: Dean's Leadership Seminar**

(1-0) Cr. 1. F.S.

*Prereq: Sophomore classification or higher; Major in Engineering*

Understanding the complexities of leadership in building an organization, decision-making styles, communication, managing change, building trust, shared responsibility leadership, creating legacy, prioritizing, effective use of authority, conflict, ethics, integrity, transparency, accountability. Selection based on demonstrated commitment to leadership development. Offered on a satisfactory-fail basis only. May not apply toward a degree in Engineering

**ENGR 396: Summer Internship**

Cr. R. Repeatable. SS.

*Prereq: Permission of Engineering Career Services*

Professional work period of at least 10 weeks during the summer.

Students must register for the course prior to commencing work. Offered on a satisfactory-fail basis only.

**ENGR 397: Engineering Condensed Internship**

Cr. R. Repeatable. SS.

*Prereq: Permission of Engineering Career Services*

Professional work period less than 10 weeks. Students must register for the course prior to commencing work. Offered on a satisfactory-fail basis only.

**ENGR 398: Cooperative Education**

Cr. R. Repeatable. F.S.

*Prereq: Permission of Engineering Career Services*

Professional work period during the fall or spring semester. One semester per academic or calendar year. Students must register for the course prior to commencing work. Offered on a satisfactory-fail basis only.

**ENGR 430: Entrepreneurial Product Engineering**

(Cross-listed with I E). Cr. 3. F.Alt. S., offered irregularly.

*Prereq: Junior classification*

Process of innovative product development in both entrepreneurial and intra-preneurial settings. Define, prototype and validate a product concept based on competitive bench-marking, market positioning and customer requirement evaluation in a target market into a product design that is consistent with defined business goals and strategies. Combination of lecture, discussion, problem solving and case study review.

**ENGR 490E: Entrepreneurship**

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: Junior or senior classification in engineering, college approval*

**ENGR 490L: Independent Study**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

Leadership.

# Engineering Mechanics (E M)

*Any experimental courses offered by E M can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## **E M 324: Mechanics of Materials**

(3-0) Cr. 3. F.S.SS.

*Prereq: C E 274*

Plane stress, plane strain, stress-strain relationships, and elements of material behavior. Application of stress and deformation analysis to members subject to centric, torsional, flexural, and combined loadings. Elementary considerations of theories of failure, buckling.

## **E M 327: Mechanics of Materials Laboratory**

(0-2) Cr. 1. F.S.

*Prereq: E M 324*

Experimental determination of mechanical properties of selected engineering materials. Experimental verification of assumptions made in 324. Use of strain measuring devices. Preparation of reports.

## **E M 362: Principles of Nondestructive Testing**

(Cross-listed with MAT E). (3-0) Cr. 3. S.

*Prereq: PHYS 132 or PHYS 232*

Radiography, ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection, and other techniques. Physical bases of tests, materials to which applicable, types of defects detectable, calibration standards, and reliability safety precautions.

## **E M 362L: Nondestructive Testing Laboratory**

(Cross-listed with MAT E). (0-3) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in E M 362 or MAT E 362*

Application of nondestructive testing techniques to the detection and sizing of flaws in materials and to the characterization of material's microstructure. Included are experiments in hardness, dye penetrant, magnetic particle, x-ray, ultrasonic and eddy current testing. Field trips to industrial laboratories.

## **E M 417: Experimental Mechanics**

(Dual-listed with E M 517). (Cross-listed with AER E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E M 324; MAT E 273*

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

## **E M 424: Intermediate Mechanics of Materials**

(3-0) Cr. 3. F.S.

*Prereq: E M 324*

Analysis of stresses, strains, and deflections. Torsion and bending of unsymmetrical members. Analysis of thick wall pressure vessels and shrink fit problems. Dynamic load effects, fatigue and fracture mechanics introduction. Work-strain energy methods.

## **E M 425: Introduction to the Finite Element Method**

(3-0) Cr. 3. S.

*Prereq: E M 324; (MATH 266 or MATH 267)*

Introduction of finite element analysis through applications to one-dimensional, steady-state problems such as elastic deformation, heat and fluid flow, consolidation, beam bending, and mass transport. Transient heat conduction and wave propagation. Two-dimensional triangular and quadrilateral elements. Plane problems of torsion, thermal and potential flow, stress analysis. Simple computer programs for one- and two-dimensional problems.

## **E M 451: Engineering Acoustics**

(Cross-listed with E E, M E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: (MATH 266 or MATH 267); PHYS 231; PHYS 231L*

The basics of acoustic wave propagation in fluids with an emphasis on sound propagation in air. Topics include transmission and reflection of sound at a boundary; role of acoustic sources in directing sound fields; diffraction of sound around solid objects; reverberation of sound in a room; and the measurement of sound fields.

## **E M 480: Ultrasonic Nondestructive Evaluation**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: E M 324; (MATH 266 or MATH 267); PHYS 232*

Introduction to stress/strain, Hooke's law, and elastic wave propagation in two dimensions in isotropic media. Ultrasonic plane-wave reflection and transmission; and simple straight-crested guided waves. Transducer construction, behavior, and performance. Simple signal analysis and discrete signal processing. The last few weeks of the course are devoted to case studies.

## **E M 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

## **E M 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**Courses primarily for graduate students, open to qualified undergraduates:**



**E M 510: Continuum Mechanics**

(3-0) Cr. 3. F.

*Prereq: MATH 385*

Introduction to Cartesian tensors as linear vector transformations. Kinematics of continuous deformations, Lagrangian and Eulerian descriptions of motion. Fundamental equations or balance laws of continuous media, linear and angular momentum balance. Conservation laws of momentum and energy. Introduction to constitutive equations of classical elastic solids and simple fluids. Formulations and solutions of some canonical problems.

**E M 514: Advanced Mechanics of Materials**

(Cross-listed with AER E). (3-0) Cr. 3. F.

*Prereq: E M 324*

Theory of stress and strain, stress-strain relationships. Unsymmetrical bending, curved beams, shear center. Torsion of thin-walled noncircular sections. Equilibrium, compatibility equations. Airy stress functions. Membrane stresses in shells, thick-walled cylinders.

**E M 516: Applied Elasticity and Mechanics of Deformable Solids**

(3-0) Cr. 3. S.

*Prereq: E M 510*

Fundamental mechanics of linear elasticity, formulation and solution of simple elastostatic boundary value problems. Kinematics of small deformations, constitutive equations for isotropic and anisotropic media. Field equations for elastic solids, plane strain/plane stress and some classic analytical solutions such as Boussinesq, Hertz, Kirsch, Lamé, and Mitchell. Stress functions and potential methods and introduction to finite elements.

**E M 517: Experimental Mechanics**

(Dual-listed with E M 417). (Cross-listed with AER E). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E M 324; MAT E 273*

Introduction to fundamental concepts for force, displacement, stress and strain measurements for structures and materials applications. Strain gage theory and application. Full field deformation measurements with laser interferometry and digital image processing. Advanced experimental concepts at the micro- and nano-scale regimes. Selected laboratory experiments.

**E M 518: Waves in Elastic Solids with Applications to Ultrasonic Nondestructive Evaluation**

(3-0) Cr. 3. F.

*Prereq: MATH 385*

Propagation of bulk waves, surface waves, and guided waves in isotropic and anisotropic elastic media. Transmission and reflection of waves at plane and curved interfaces. Radiation of sources with application to ultrasonic transducer beam modeling. Elastic wave scattering from cracks and inclusions. Reciprocity principles and their use in the development of an ultrasonic measurement model. Characterization and measurement of material attenuation.

**E M 525: Finite Element Analysis**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: E M 425, MATH 385*

Variational and weighted residual approach to finite element equations. Emphasis on two- and three-dimensional problems in solid mechanics. Isoparametric element formulation, higher order elements, numerical integration, imposition of constraints and penalty, convergence, and other more advanced topics. Use of two- and three-dimensional computer programs. Dynamic and vibrational problems, eigenvalues, and time integration. Introduction to geometric and material nonlinearities.

**E M 526: Boundary Element Methods in Engineering**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E M 514 or E M 516*

Introductory boundary element methods through plane problems. Singular integrals, Cauchy principal values, integral representations and boundary integrals in one dimension. Direct and indirect formulations. Plane potential and elastostatic problems. Higher order elements, numerical integration. Regularizations. Body forces and infinite regions. Specialized fundamental solutions, half-plane and axisymmetric problems. Diffusion and wave problems. Coupling with finite elements.

**E M 543: Introduction to Random Vibrations and Nonlinear Dynamics**

(Cross-listed with M E). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Vibrations of continuous systems. Nonlinear vibration phenomena, perturbation expansions; methods of multiple time scales and slowly-varying amplitude and phase. Characteristics of random vibrations; random processes, probability distributions, spectral density and its significance, the normal or Gaussian random process. Transmission of random vibration, response of simple single and two-degree-of-freedom systems to stationary random excitation. Fatigue failure due to random excitation.

**E M 548: Advanced Engineering Dynamics**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: E M 345, MATH 266 or MATH 267*

3-D kinematics and dynamics of particles and rigid bodies. Coordinate systems, calculus of variations. Lagrange's equations with constraints, modified Euler's equations, torque-free motion of rigid bodies in 3-D, moment equations with constraints.

**E M 550: Nondestructive Evaluation**

(Cross-listed with M S E). (3-2) Cr. 4. S.

*Prereq: E M 324, MATH 385*

Principles of five basic NDE methods and their application in engineering inspections. Materials behavior and simple failure analysis. NDE reliability, and damage-tolerant design. Advanced methods such as acoustic microscopy, laser ultrasonics, thermal waves, and computed tomography are analyzed. Computer-based experiments on a selection of methods: ultrasonics, eddy currents, x-rays are assigned for student completion.

**E M 564: Fracture and Fatigue**

(Cross-listed with AER E, M E, M S E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.*

*Undergraduates: Permission of instructor*

Materials and mechanics approach to fracture and fatigue. Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**E M 566: Phase Transformation in Elastic Materials**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: EM 510 or EM 516 or EM 514*

Continuum thermodynamics and kinetics approaches to phase transformations. Phase field approach to stress- and temperature-induced martensitic transformations and twinning at the nanoscale. Nucleation and growth. Nanostructural evaluation. Analytical and numerical solutions. Surface stresses and energy. Surface-induced phase transformations. Large Strain formulation.

**E M 567: Nanomechanics of Materials**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or consent of instructor*

Continuum theoretical and computational approaches to material deformation and nanostructure evolution. Thermodynamics and kinetics. Nucleation and growth. Surface and interface tension and phenomena. Chemical reactions, phase transformations, and dislocation evolution.

**E M 569: Mechanics of Composite and Combined Materials**

(Cross-listed with AER E, M S E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: E M 324*

Mechanics of fiber-reinforced materials. Micromechanics of lamina. Macromechanical behavior of lamina and laminates. Strength and interlaminar stresses of laminates. Failure criteria. Stress analysis of laminates. Thermal moisture and residual stresses. Joints in composites.

**E M 570: Wind Engineering**

(Cross-listed with AER E). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: A B E 378, M E 345*

Atmospheric circulations, atmospheric boundary layer wind, bluff-body aerodynamics, aeroelastic phenomena, wind-tunnel and full-scale testing, wind-load code and standards, effect of tornado and thunderstorm winds, design applications.

**E M 580: Phase Transformations and Plasticity**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or permission of instructor*

Continuum approaches to phase transformations and plasticity at nano-, micro-, and macroscales. Interaction between phase transformations and plasticity and different scales. Temperature-, stress-, and strain-induced phase transformations. Transformation-induced plasticity. Thermodynamics and kinetics. Nucleation and growth. Large strain formulation. High pressure phenomena and theories.

**E M 584: High Pressure Mechanics and Phase Transformations**

(3-0) Cr. 3.

*Prereq: EM 566 or EM 510 or EM 514 or consent of instructor*

Techniques for producing static high pressure and measurements. Traditional and rotational diamond anvil cell. Phase diagrams. Pressure, stress, and plastic strain induced phase transformations: continuum thermodynamics and kinetics. Elasticity and plastic flow under high pressure. Transformation pressure hysteresis. Material synthesis and search for new phases. Interaction between phase transformations and plasticity under high pressure. High pressure mechanochemistry. Multiscale modeling.

**E M 586: Micromechanics of Structural Changes in Materials**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: E M 566 or E M 510 or E M 514 or permission of instructor.*

Continuum and micromechanical approaches to material deformation, phase transformations, and microstructure evolution. Thermodynamics and kinetics. Eshelby inclusion. Interface propagation and reorientation. Microscale phase field approach. Large strain formulation. Phase transformations, chemical reactions, twinning, and fracture.

**E M 590: Engineering Mechanics Special Topics**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

**E M 590F: Engineering Mechanics Special Topics: Introduction to Dislocation and Plasticity**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

**E M 590H: Engineering Mechanics Special Topics: Mechanics of Thin Films and Adhesives**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

**E M 590I: Engineering Mechanics Special Topics: Mechanics of Cellular and Porous Media**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

**E M 590J: Engineering Mechanics Special Topics: Other**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor*

**E M 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**E M 690: Engineering Mechanics Special Topics**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690N: Engineering Mechanics Special Topics: Advanced Experimental Methods**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690O: Engineering Mechanics Special Topics: Advanced Wave Propagation**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690P: Engineering Mechanics Special Topics: Advanced Materials**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690Q: Engineering Mechanics Special Topics: Advanced Computational Methods**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690R: Engineering Mechanics Special Topics: Reliability and Failure**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 690S: Engineering Mechanics Special Topics: Other**

Cr. 1-6. Repeatable.

*Prereq: Permission of instructor*

**E M 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq: Permission of DOGE (Director of Graduate Education), graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**E M 699: Research**

Cr. arr. Repeatable.

## English (ENGL)

*Any experimental courses offered by ENGL can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**ENGL 099: Strategies for Nonnative Speakers of English**

Cr. 0. F.S.

*Prereq: Completion of placement exam*

**ENGL 099S: Strategies for Nonnative Speakers of English: Academic Speaking and Pronunciation**

Cr. 0. F.S.

Open to all interested international students.

**ENGL 101: English for Native Speakers of Other Languages**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam*

For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 101B: English for Native Speakers of Other Languages: Academic English**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam*

For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 101C: English for Native Speakers of Other Languages: Academic English II--Undergraduates**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam.*

For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 101D: English for Native Speakers of Other Languages: Academic English II--Graduates**

(3-0) Cr. 3. F.S.

*Prereq: Completion of placement exam.*

Available P/NP to graduate students at their department's option. For undergraduates: Completion of ENGL 101 requirement prepares students for ENGL 150. For graduates: Completion of ENGL 101 satisfies the English requirement of the Graduate College. ENGL 101 courses are limited to students who are nonnative speakers of English. See English Requirement for International Students in Index for additional information about placement exam. Credit from ENGL 101 does not count toward graduation.

**ENGL 120: Computers and Language**

(Cross-listed with LING). (3-0) Cr. 3.

Introduction to the use of linguistic knowledge in computer applications today and the basic computational techniques used in such applications. The development of these techniques throughout the history of computational linguistics. How the study of language has contributed to the advancement of technology and how certain computational problems have influenced the way linguists study language.

**ENGL 150: Critical Thinking and Communication**

(3-0) Cr. 3. F.S.SS.

Application of critical reading and thinking abilities to topics of civic and cultural importance. Introduction of basic oral, visual, and electronic communication principles to support writing development. Initiation of communication portfolio. Concurrent enrollment in LIB 160 is recommended.

**ENGL 201: Introduction to Literature**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Introduction to the diversity of literary texts. Students will explore work across different genres (drama, poetry, short fiction, the novel) and traditions (Indigenous, postcolonial, global, British, American). Recommended for nonmajors.

**ENGL 207: Introduction to Creative Writing**

(3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Course introduces students to the fundamentals of writing fiction, poetry, and creative nonfiction. Extensive readings in all three genres. Students learn creative processes through writing exercises, workshops, and conferences.

**ENGL 214: Introduction to Technical Communication**

Cr. 3. F.

*Prereq: ENGL 150*

A broad introduction to the culture of professional work as a technical communicator, with particular emphasis on principles and best practices for developing and managing technical information and digital media. Examination of user-centered design, the history of the discipline, cross-cultural communication, and the ethics of communicating complex information to lay audiences. Study and practice of team-based collaboration, project management, and technical editing.

**ENGL 219: Introduction to Linguistics**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Introduction to linguistic concepts and principles of linguistic analysis with English as the primary source of data. Sound and writing systems, sentence structure, vocabulary, and meaning. Issues in the study of usage, regional and social dialects, language acquisition, and language change.

**ENGL 220: Descriptive English Grammar**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

Overview of grammatical structures and functions. Parts of speech; phrase, clause, and sentence structure; sentence types and sentence analysis; rhetorical grammar and sentence style; terminology. Not a remedial, English composition, or ESL course.

**ENGL 225: Survey of British Literature to 1800**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Survey of British Literature from its beginnings to 1800. Representative works studied in their historical, cultural, and literary contexts that span nearly 900 years of shifts in religious, political, ethnic, and philosophical cultures.

**ENGL 226: Survey of British Literature since 1800**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Representative works studied in their historical, cultural, and literary contexts, including attention to the impact and legacy of the British empire on its former colonies, i.e., postcolonial literature.

**ENGL 227: Survey of American Literature to 1865**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Survey of American literature from its beginnings (including Indigenous and conquest literatures) through the end of the Civil War. Representative works studied in their historical, cultural, and literary contexts, including attending to the diversity (ethnic, cultural, religious, philosophical, etc.) of American literature and culture.

**ENGL 228: Survey of American Literature since 1865**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Survey of American literature from the Civil War to the present. Representative works studied in their historical, cultural, and literary contexts, including attention to the diversity (ethnic, cultural, religious, philosophical, etc.) of American literature and culture.

**ENGL 237: Survey of Film History**

(2-3) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Survey of U.S. and international film history from its beginnings in the late nineteenth century to the present. Class meets for two hours per week for lecture and discussion. Lab meets for up to three hours per week for film screenings.

**ENGL 240: Introduction to American Indian Literature**

(Cross-listed with AM IN). (3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Survey of American Indian Literature of varying genres, including fiction, non-fiction, poetry, film, drama, and media. Focuses on interdisciplinary approaches to American Indian cultural, social, and environmental issues.

**ENGL 250: Written, Oral, Visual, and Electronic Composition**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 150; credit or concurrently enrollment in LIB 160; Sophomore classification or above*

Analyzing, composing, and reflecting on written, oral, visual, and electronic (WOVE) discourse within academic, civic, and cultural contexts. Emphasis on supporting a claim and using primary and secondary sources. Continued development of communication portfolio. The University requires a minimum grade of C in ENGL 250 to meet the Communication Proficiency graduation requirement; some majors/degree programs may set higher standards.

**ENGL 250H: Written, Oral, Visual, and Electronic Composition: Honors**

(3-0) Cr. 3. F.

*Prereq: Admission to Honors Program; ENGL 150; credit or concurrent enrollment in LIB 160*

In-depth analysis, composition, and reflection on written, oral, visual, and electronic (WOVE) discourse within academic, civic, and cultural contexts. Emphasis on argumentation: developing claims, generating reasons, providing evidence. Individual sections organized by special topics. Development of communication portfolio. The University requires a minimum grade of C in ENGL 250 to meet the Communication Proficiency graduation requirement; some majors/degree programs may set higher standards.

**ENGL 260: Introduction to Literary Study**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in ENGL 150*

Introduction to the basic principles of literary study, including strategies for analyzing poetry, fiction, nonfiction, film, drama, and media. Emphasis on writing critical essays and conducting research. Designed for English majors.

**ENGL 275: Analysis of Popular Culture Texts**

(Cross-listed with SP CM). (3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in ENGL 250*

Analysis of how information and entertainment forms persuade and manipulate audiences. Study of several forms that may include newspapers, speeches, television, film, advertising, fiction, and magazines. Special attention to verbal and visual devices.

**ENGL 302: Business Communication**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 250; Junior classification*

Rhetorical concepts and processes to successfully communicate individually and collaboratively via written, oral, visual, and electronic modes across a range of business disciplines. Covers strategies for analyzing audiences internal and external to an organization in order to communicate positive, neutral, and negative messages clearly, completely, correctly, and ethically; save an audience's time; and create goodwill.

**ENGL 302H: Business Communication: Honors**

(3-0) Cr. 3. F.S.SS.

*Prereq: Admission to Honors Program; ENGL 250; Junior classification*

Theory, principles and processes of effective written, oral, visual, and electronic communication typically encountered in business and the professions. Extensive practice in many areas of workplace communication, including letter, memo, and email correspondence; short proposals and reports; policies and procedures; job packet including letters of application and resumes; website analysis; brochures; and individual and team presentations.

**ENGL 303: Free-Lance Writing for Popular Magazines**

(3-0) Cr. 3. S.

*Prereq: ENGL 250; Sophomore classification*

Practical workshop in writing nonfiction articles for popular magazines. Emphasis on writing, market research, preparation of manuscripts, methods of submission. Major goal of the course is production of marketable material.

**ENGL 304: Creative Writing: Fiction**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250; Sophomore classification*

Progresses from practice in basic techniques of fiction writing to fully developed short stories. Emphasis on writing, analytical reading, workshop criticism, and individual conferences.

**ENGL 305: Creative Writing: Nonfiction**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250; Sophomore classification*

Workshop in writing imaginative essays, both critical and personal. Analytical reading, development of literary techniques. Individual and small group conferences.

**ENGL 306: Creative Writing: Poetry**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250; Sophomore classification*

Progresses from traditional to contemporary forms. Emphasis on writing, analytical reading, workshop criticism, and individual conferences.

**ENGL 308: Write Like a Woman**

(Cross-listed with WGS). (3-0) Cr. 3. F.

*Prereq: ENGL 250*

Writing and reading interpretive fiction written by women. Emphasis on stories that embody a female literary life, gender-specific ways of creating characters and conflicts, analytical reading and writing, workshop criticism and shared commentaries. Includes multi-modal projects.

**ENGL 309: Proposal and Report Writing**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250; Junior classification*

Rhetorical concepts and processes to individually and collaboratively develop proposals for business, governmental, nonprofit, or other organizations and to report on the work completed both orally and in writing. Emphasizes the structure and classification of proposal and report types, qualitative and quantitative research methods, audience analysis, document design, and data visualization.

**ENGL 310: Rhetorical Analysis**

(Cross-listed with SP CM). (3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Fundamental principles of rhetorical criticism. Focus on selected theories for analyzing cultural texts, including essays, speeches, film, technical and scientific documents, and websites. Emphasis on identifying artifacts, formulating research questions, applying methodologies, and understanding and practicing critical analysis through discussion and in writing.

**ENGL 312: Communicating Science and Public Engagement**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 250*

Rhetorical concepts, processes, and strategies to successfully communicate individually and collaboratively via written, oral, visual, and electronic modes in disciplines in and related to science. Emphasizes the strategies for analyzing and adapting to audiences about scientific topics and disciplines. Covers developing and designing documentation, presenting scientific data visually, and communicating results orally.

**ENGL 313: Rhetorical Website Design**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Rhetorical principles of multimodal composing in hypertextual environments. Focus on writing according to web style guidelines, employing cascading stylesheets for layout and design, and using principles of information architecture to determine optimal site structure. Final project involves constructing interactive client site using latest web standards.



**ENGL 314: Technical Communication**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 250; Junior classification*

Rhetorical concepts and processes to successfully communicate technical information individually and collaboratively via written, oral, visual, and electronic modes. Emphasizes the major strategies for analyzing expert and lay audiences and adapting information to those audiences. Covers developing and designing usable technical documentation, visualizing data, and presenting technical information orally.

**ENGL 314H: Technical Communication: Honors**

(3-0) Cr. 3. F.S.SS.

*Prereq: Admission to Honors Program; ENGL 250; Junior classification*

Theories, principles, and processes of effective written, oral, visual, and electronic communication of technical information. Attention to major strategies for analyzing and adapting to audiences in various communication situations and composing technical discourse including organizing visual and verbal information. Extensive practice in many areas of technical communication, including instructions and procedures, proposals and reports, website analysis and design, and individual and team presentations.

**ENGL 315: Creative Writing: Screenplays**

(3-0) Cr. 3. F.

*Prereq: ENGL 250; Sophomore classification*

Stresses master scene technique of writing fully developed screenplays. Emphasis on movie techniques, writing, workshop criticism, analytical reading and viewing, and individual conferences.

**ENGL 316: Creative Writing: Playwriting**

(Cross-listed with THTR). (3-0) Cr. 3. S.

*Prereq: ENGL 250; Sophomore classification*

Progresses from production of scenes to fully developed one-act plays. Emphasis on action, staging, writing, analytical reading, workshop criticism, and individual conferences.

**ENGL 318: Introduction to ESL methods and materials**

(Cross-listed with LING). (3-0) Cr. 3. F.

*Prereq: ENGL 219 or LING 219*

Introduction to methods and materials for teaching English as a Second Language (ESL) for elementary and secondary students. Strategies and resources for teaching reading, writing, speaking and listening skills. Elementary Education students must take this course in the same semester as either EDUC 280S or EDUC 480S.

**ENGL 319: Studies in Language and Diversity**

(Cross-listed with LING). Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ENGL 250*

Special topics related to the role of language and linguistics in US diversity, such as Dialects and American literature, American English Accents, Legal and Social Aspects of English-only Laws in the US. Connections between language use and social diversity.

**ENGL 320: Topics in Linguistic Structure**

(Cross-listed with LING). Cr. 3. Repeatable, maximum of 9 credits. S.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220)*

Special topics related to the study of linguistic structure. Focus on language structure in areas not covered in detail by existing courses. Topics include field linguistics, morphology, forensic linguistics, neurolinguistics, semantics, non-English phonology, acoustic phonetics, linguistic universals, and historical linguistics.

**ENGL 322: Language and Society**

(Cross-listed with LING). Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

Introduction to variation in language use in society. Survey of factors affecting language use, including background characteristics of language users, location, and purpose of interaction in addition to institutional, state, and national language policies.

**ENGL 324: Introduction to Teaching ESL Literacy**

(Cross-listed with LING). Cr. 3. F.

*Prereq: ENGL 219 or LING 219*

Introduction to the issues and methods involved in teaching literacy skills to English as a second language (ESL) learners. The nature of literacy and materials and methods for developing ESL literacy at the middle school, high school, and adult ages across multiple levels of competency.

**ENGL 325: Teaching Methods for ESL Learners: Oral Communication Skills**

(Cross-listed with LING). Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

Issues and methods in teaching oral communication skills (listening, speaking, pronunciation) to English as a second language (ESL) learners. The nature of oral language ability. Materials and Methods for developing oral communication skills at middle school, high school, and adult contexts.

**ENGL 330: Science Fiction**

(3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of science fiction from its origins to the present. Highlights the genre's connections to issues related to gender, sexuality, race, empire, and environmentalism. May include study of cyberpunk, Afrofuturism, cli-fi, etc.

**ENGL 332: Visual Communication of Quantitative Information**

(Cross-listed with STAT). (3-0) Cr. 3.

*Prereq: ENGL 250; (STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 231 or STAT 305 or STAT 322 or STAT 330)*

Communicating quantitative information using visual displays; visualizing data; interactive and dynamic data displays; evaluating current examples in the media; color, perception, and representation in graphs; interpreting data displays.

**ENGL 335: Studies in Film**

(2-3) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of film that explores a specific cinematic genre, style, period, or theme. Class meets for two hours per week for lecture and discussion. Lab meets for up to three hours per week for film screenings.

**ENGL 339: Literary Theory and Criticism**

(3-0) Cr. 3.

*Prereq: ENGL 260; 3 additional credits from (ENGL 225-227, ENGL 240, ENGL 310, ENGL 340, ENGL 344-347, ENGL 349, ENGL 440-441, ENGL 445, ENGL 352-355, ENGL 360, ENGL 362, ENGL 364, ENGL 373, ENGL 375, ENGL 376, ENGL 376A, ENGL 376B, ENGL 389, ENGL 490A, ENGL 395A)*

Focused examination of the history and recent trends in literary theory and criticism (e.g., postcolonialism, queer theory, disability studies, ecocriticism).

**ENGL 345: Women and Literature: Selected Topics**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of literature by women and about women that focuses on a particular genre (fiction, non-fiction, poetry, film, drama, media), author, or theme.

**ENGL 346: American Indian Literature**

(Cross-listed with AM IN). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of American Indian literature of varying genres, including fiction, non-fiction, poetry, film, drama, and media. Examines interdisciplinary approaches to American Indian cultural, social, and environmental issues.

**ENGL 347: Studies in African American Literature**

(Cross-listed with AF AM). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of literature by African American writers. May include focus on a particular genre (fiction, non-fiction, poetry, film, drama, media), author, event, movement, or theme.

**ENGL 349: Topics in Multicultural Literatures of the United States**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of literature by writers from U.S. multicultural groups. May include literature of several groups or focus upon one (such as Asian Americans, African Americans, Latinx Americans, American Indians). May also include focus on a particular genre (fiction, non-fiction, poetry, film, drama, media), event, movement, or theme.

**ENGL 350: Rhetorical Traditions**

(Cross-listed with CL ST, SP CM). (3-0) Cr. 3. S.

*Prereq: ENGL 250*

Ideas about the relationship between rhetoric and society in contemporary and historical contexts. An exploration of classical and contemporary rhetorical theories in relation to selected topics that may include politics, gender, race, ethics, education, science, or technology.

**ENGL 352: Queer Literature**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of literary portrayals of queer lives and relationships from many different genres. Attention to changing definitions and representations of sexual orientation and LGBTQ identities over time.

**ENGL 353: World Literature: Western Foundations through Renaissance**

(Cross-listed with CL ST). (3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Representative works of drama, poetry, and prose from ancient times through the mid-seventeenth century. Consideration of Western traditions within global contexts. Attention to religious and ethnic diversity; oral, manuscript, and print cultures; political authority; and the impact of translation on form, meaning, and reception of texts. Meets International Perspectives Requirement.

**ENGL 354: World Literature: Seventeenth Century to the Present**

(3-0) Cr. 3. S.

*Prereq: ENGL 250*

Global literatures in their various cultural and aesthetic contexts. Representative works, oral and written literature, including poetry, fiction, nonfiction, and drama. Meets International Perspectives Requirement.

**ENGL 355: Literature and the Environment**

(Cross-listed with ENV S). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of texts that address a wide range of environmental issues, including the relationship between humans and natural/urban environments, views of other-than-human beings, food, climate change, extinction, and social and racial justice. Assignments for the course may include research, exams, writing, and/or individual/group projects.

**ENGL 360: Studies in American Literature to 1800**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings in American literature from its beginnings through the colonial period; may reflect themes, genres, or social and cultural contexts.

**ENGL 362: Studies in 19th Century American Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings in American literature of the 19th century; may reflect themes, genres, or social and cultural contexts.

**ENGL 364: Studies in American Literature: 1900 to the Present**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings in American literature since 1900; may reflect themes, genres, or social and cultural contexts.

**ENGL 370: Shakespeare**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Focused study of Shakespeare's plays and how they participate in cultural and political contexts – both in Shakespeare's time and our own. Includes staging activities, film presentations, and attention to pedagogy. Assignments for the course may include analytical essays (no research required), film presentations, marginalia, and individual/group projects. Meets International Perspectives Requirement.

**ENGL 373: Studies in British Literature: The Middle Ages**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings in medieval literature from its beginnings through the fifteenth century; may reflect themes, genres, or social and cultural contexts.

**ENGL 375: Studies in British Literature: The Restoration and 18th Century**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings in British literature from 1660 to 1800; may reflect themes, genres, or social and cultural contexts. Meets International Perspectives Requirement.

**ENGL 376: Studies in British Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250; Sophomore classification*

Selected readings from British literature from the late eighteenth century to about 1900; may reflect themes, genres, or social and cultural contexts.

Meets International Perspectives Requirement.

**ENGL 376A: Studies in British Literature: Romantic**

(3-0) Cr. 3.

*Prereq: ENGL 250; Sophomore classification*

Selected readings from British literature from the late eighteenth century to about 1900; may reflect themes, genres, or social and cultural contexts.

Meets International Perspectives Requirement.

**ENGL 376B: Studies in British Literature: Victorian**

(3-0) Cr. 3.

*Prereq: ENGL 250; Sophomore classification*

Selected readings from British literature from the late eighteenth century to about 1900; may reflect themes, genres, or social and cultural contexts.

Meets International Perspectives Requirement.

**ENGL 389: Postcolonial Literature**

(3-0) Cr. 3.

*Prereq: ENGL 250; Sophomore classification*

Focused study of literatures from previously (or continuously) colonized nations. May be broadly focused, or specific to the literature of one of the following areas: Africa, South Asia, the Caribbean, and the Middle East. Irish and immigrant British writers may also be included. Assignments for the course may include exams, written reflections and/or discussion boards, short essays, posters, and/or individual/group projects.

Meets International Perspectives Requirement.

**ENGL 393: The History of Children's Literature**

(3-0) Cr. 3. F.

*Prereq: ENGL 250*

Focused study of the development of English and American children's literature through the present day. Includes readings in animal stories, fantasy, and realism, including contemporary social issues.

**ENGL 395: Study and Travel**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 395A: Study and Travel: Literature**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 395B: Study and Travel: Creative Writing**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 395C: Study and Travel: Linguistics**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 395D: Study and Travel: Rhetoric and Professional Communication**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 395E: Study and Travel: Teacher Education**

Cr. arr. SS.

*Prereq: Permission of Instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

Meets International Perspectives Requirement.

**ENGL 396: Teaching the Reading of Young Adult Literature**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Critical study and evaluation of themes, genres, and cultures found in young adult literature. Strategies of effective reading; instructional strategies including discussion techniques and use of technology; matching texts to reader needs and proficiencies. Evaluation of fiction, nonfiction, and media-based materials for use in school programs. Lesson planning.

**ENGL 397: Practice and Theory of Teaching Writing in the Secondary Schools**

(3-0) Cr. 3. F.S.

*Prereq: Concurrent enrollment in EDUC 380*

Introduction to teaching secondary language arts. Current theories and practices in the teaching of writing to secondary school students. Theories of rhetoric, approaches to teaching, lesson design and planning. Evaluating writing. Students must have initiated the application process for the teacher education program and initiated a background check with the state of Iowa Department of Criminal Investigation.

**ENGL 404: Creative Writing Workshop: Fiction**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: ENGL 304*

Individual projects in short fiction on a workshop and conference basis. Readings in short fiction. Discussion of elements of narrative such as plot, point of view, characterization, theme, setting.

**ENGL 405: Creative Writing Workshop: Nonfiction**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: ENGL 305*

Individual projects in memoir, immersion journalism, character studies, and/or the personal essay on a workshop and conference basis. Readings in creative nonfiction.

**ENGL 406: Creative Writing Workshop--Poetry**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: ENGL 306*

Individual projects in poetry on a workshop and conference basis. Readings in poetry. Discussion of poetic elements such as image, sound, internal structure, rhythm, tone, figurative language.

**ENGL 410: Language as Data**

(Cross-listed with LING). Cr. 3. S.

*Prereq: Junior classification*

Methods of discovering language patterns in text documents solve practical text analysis problems in the disciplines. Fundamentals of linguistics and its role in text analysis. Practice writing R scripts to perform text analysis and visualize textual data.

**ENGL 411: Technology, Rhetoric, and Professional Communication**

(3-0) Cr. 3.

*Prereq: ENGL 310; (ENGL 302, ENGL 309, ENGL 313, or ENGL 314); Junior classification*

Seminar course on the implication of technologies, especially computer technology, for the writing and reading of business, technical, and academic texts. Extensive reading, discussion, and writing on selected technology-related topics.

**ENGL 415: Business and Technical Editing**

(3-0) Cr. 3. S.

*Prereq: (ENGL 302, ENGL 309, or ENGL 314); Junior classification*

Editing concepts and processes for choosing the appropriate level of editing for the particular rhetorical situation. Covers using editorial tools such as copy-marking symbols, developing style sheets and guides, and managing document production. Emphasizes developing an editorial eye for verbal and visual details in order to achieve accuracy, consistency, correctness, and completeness.

**ENGL 416: Visual Aspects of Business and Technical Communication**  
(3-0) Cr. 3. F.

*Prereq: (ENGL 302, ENGL 309, or ENGL 314); Junior classification*

Rhetorical strategies and perceptual principles for designing print and digital visual elements such as diagrams and graphs and integrating those visual elements into business and technical communications. Covers strategies for employing visual elements such as typeface, page and screen layout, and illustrations in order to make communications more usable.

**ENGL 417: Student Teaching**

Cr. arr. F.S.

*Prereq: admission to teacher education, approval of coordinator the semester prior to student teaching*

Full-time teaching in content licensure area: long term and unit planning, lesson planning, classroom teaching practice.

**ENGL 417E: Student Teaching: English and Literature**

(Cross-listed with EDUC). Cr. arr. Repeatable. F.S.

*Prereq: ENGL 494, admission to teacher education, approval of coordinator the semester prior to student teaching*

Full-time teaching in secondary English: long term and unit planning, lesson planning, classroom teaching practice in English language arts.

**ENGL 418: Seminar in Argumentation**

(Cross-listed with SP CM). (3-0) Cr. 3. F.S.

*Prereq: (ENGL 310 or SP CM 310); Junior classification*

Advanced seminar in theory and analysis with extensive practice in various modes of argument.

**ENGL 420: History of the English Language**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220)*

Comparison of English to other languages by family background and by type. Analysis of representative Old, Middle, Early Modern and present-day English texts, including both literary works and non-literary documents.

**ENGL 422: Women, Men, and the English Language**

(Cross-listed with LING, WGS). (3-0) Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

The ways men and women differ in using language in varied settings and the ways in which language both creates and reflects gender divisions.

**ENGL 425: Second Language Learning and Teaching**

(Cross-listed with LING). (3-0) Cr. 3. S.

*Prereq: (ENGL 219 or LING 219); Junior classification*

The process of second language learning and principles and techniques of teaching second languages. Learning and teaching in specific situations and for particular purposes. Current applications of technology in teaching and assessment.

**ENGL 437: Grammatical Analysis**

(Cross-listed with LING). (3-0) Cr. 3. F.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220); Junior classification*

Theories and methods for analysis of syntax and morphology.

**ENGL 440: Seminar in British Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Selected authors, movements, eras, or genres in British literature.

Readings in criticism; required research paper.

**ENGL 441: Seminar in American Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Selected authors, movements, eras, or genres in American literature.

Readings in criticism; required research paper.

**ENGL 445: Seminar: Literature Crossing Boundaries**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Intensive study of selected literature that bridges traditional genre, period, national, or disciplinary boundaries. Readings in criticism; required research paper.

**ENGL 450: Seminar in Literary Genres**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Intensive study of drama, film, fiction, poetry, or prose. Selected movements, eras, or national traditions. Readings in criticism; required research paper.

**ENGL 460: Seminar in Gender and Ethnicity**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Selected readings of various authors, movements, eras, or genres.

Readings in criticism; required research paper.

**ENGL 477: Seminar in Technical Communication**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 302 or ENGL 309 or ENGL 314*

Intensive study of a selected topic that bridges theory and practice in technical communication. Required project that contributes to the understanding of an emerging issue in the profession.

**ENGL 487: Internship in Business, Technical, and Professional Communication**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in (ENGL 302, ENGL 309, ENGL 313, ENGL 314, ENGL 415, ENGL 416, or ENGL 477); Junior classification; Department permission*

An opportunity to write, edit, and design business and technical documents in a professional setting. Projects might include reports, proposals, manuals, brochures, newsletters.

**ENGL 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490A: Independent Study: Literature**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490B: Independent Study: Linguistics**

(Cross-listed with LING). Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490C: Independent Study: Rhetoric, Teaching of Composition**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490D: Independent Study: Criticism and Theory of Literature**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490E: Independent Study: Instructional Methods and Research**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490F: Independent Study: Creative Writing**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490G: Independent Study: Business/Technical Communication**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 490H: Independent Study: Honors**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered or who desire to integrate a study of literature or language with special problems in major fields. No more than 9 credits of ENGL 490 may be used toward graduation.

**ENGL 492: Undergraduate Teaching Experience**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department permission*

Teaching assistant experience.

**ENGL 493: Advanced Creative Writing Workshop—Multi-Genre**

Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: (ENGL 304, ENGL 305, or ENGL 306); Junior standing*

Advanced workshop of individual creative writing projects in short fiction, nonfiction, and poetry. Readings and discussion of published examples of short fiction, nonfiction, and poetry by authors of national and international note. Extensive discussion and written analysis of elements of craft across genres.



**ENGL 494: Practice and Theory of Teaching Literature in the Secondary Schools**

(3-0) Cr. 3. F.S.

*Prereq: ENGL 310; ENGL 397; 9 additional credits in ENGL beyond ENGL 250; PSYCH 333*

Current theories and practices in the teaching of literature to secondary school students. Integrating literary study and writing. Preparation and selection of materials. Classroom presentation. Unit planning. Students must have initiated the application process for the teacher education program and initiated a background check with the state of Iowa Department of Criminal Investigation. Concurrent enrollment in EDUC 480 and SP ED 401 required.

**ENGL 497: Capstone Assessment**

Cr. 1. F.S.

*Prereq: Junior classification; Department Permission*

Must be taken in conjunction with a 400-level English course.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ENGL 500: Teaching Multimodal Composition**

(3-0) Cr. 3. F.

*Prereq: Graduate classification; must be teaching Engl 150 or Engl 250 concurrently*

Introduction to the teaching of ISUComm Foundation Courses. Foundational and relevant newer composition theory and pedagogical methods related to ISUComm Foundation Courses objectives and their classroom enactment, including development of assignments and supporting activities, and evaluation of student projects. Required of all new teaching assistants teaching ISUComm Foundation Courses.

**ENGL 501: Introduction to Research in Rhetoric, Composition, and Professional Communication**

(3-0) Cr. 3.

*Prereq: 6 graduate credits in English*

Survey of the major rhetorical, qualitative, and quantitative methods used in research on communication and language in academic and nonacademic settings.

**ENGL 503: Composition Theory**

(3-0) Cr. 3.

*Prereq: 6 graduate credits in English*

In-depth consideration of the theory and practice of composition pedagogy. Opportunities for actual classroom application.

**ENGL 504: Theory and Practice of Teaching Advanced Composition**  
(3-0) Cr. 3. F.

*Prereq: Senior classification*

Theory of teaching technical, business, and science communication courses combined with practical matters related to such courses, including curriculum planning, assignment design, assessment of student work, and online teaching.

**ENGL 505: User Experience Architecture and Testing**

(3-0) Cr. 3.

*Prereq: Senior classification*

Seminar course examining user experience (UX) interface design and development in technical communication. Focus is on the UX project cycle: creating user interfaces, conducting user research, system testing, and implementing data-driven results.

**ENGL 506: Professional Communication Theory**

(3-0) Cr. 3.

*Prereq: Admission to English Department graduate degree program*

Introduction to professional communication as a discipline, with emphasis on theories of communication and discourse that inform professional communication research and on trends and developments in that research and the field.

**ENGL 508: Writing for Academic Publication**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: 6 graduate credits*

Hands-on practice in writing academic discourse for publication; rhetorical analyses of student-selected academic journals; discussion of current trends in academic writing; professional perspectives on the referee process and on journal editorial decision making. Focus on the writing of selected short pieces (opinion essays, standard reviews, conference-length papers) and of article-length manuscripts.

**ENGL 510: Introduction to Computers in Applied Linguistics**

(Cross-listed with LING). (3-0) Cr. 3. F.

*Prereq: Graduate classification*

Use of software and web applications for language teaching, linguistic analysis, and statistical analysis. Issues and problems in applied linguistics related to computer methods.

**ENGL 511: Introduction to Linguistic Analysis**

(Cross-listed with LING). (3-0) Cr. 3. F.

*Prereq: Graduate classification*

Principles and methods of linguistic analysis with emphasis on phonology, morphology, and syntax. Description of linguistic variation and current theoretical approaches to linguistics.

**ENGL 512: Second Language Acquisition**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theory, methods, and results of second language acquisition research with emphasis on approaches relevant to second language teaching.

**ENGL 513: Language Assessment Practicum**

(Cross-listed with LING). (3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 519 or LING 519*

Advanced practicum in language assessment.

**ENGL 514: Sociolinguistics**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theories and methods of examining language in its social setting.

Analysis of individual characteristics (e.g., age, gender, ethnicity, social class, region), interactional factors (e.g., situation, topic, purpose) and national policies affecting language use.

**ENGL 515: Statistical Natural Language Processing**

(Cross-listed with HCI, LING). (3-0) Cr. 3.

*Prereq: STAT 330 or equivalent, recommended ENGL 219 or LING 219, or ENGL 511 or LING 511*

Introduction to computational techniques involving human language and speech in applications such as information retrieval and extraction, automatic text categorization, word prediction, intelligent Web searching, spelling and grammar checking, speech recognition and synthesis, statistical machine translation, n-grams, POS-tagging, word-sense disambiguation, on-line lexicons and thesauri, markup languages, corpus analysis, and Python programming language.

**ENGL 516: Methods of Formal Linguistic Analysis**

(Cross-listed with LING). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 219/LING 219 or equivalent.*

Data and knowledge structures for formal representation of natural language and speech data. Designing and implementing algorithms for automating linguistic analysis tasks. Conceptual issues for natural language and speech processing programming.

**ENGL 517: Corpus Linguistics**

(Cross-listed with LING). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in Linguistics*

Corpus linguistics methods of language analysis, including corpus design, construction and annotation; data in corpus studies; tools and methods of analysis. Corpus methods applied in vocabulary, grammar, register and dialect variation, language change, pragmatics, semantics, stylistics, language learning and teaching, and language testing.

**ENGL 519: Second Language Assessment**

(Cross-listed with LING). (3-0) Cr. 3. S.

*Prereq: ENGL 511 or LING 511*

Principles of second language assessment including reliability, validity, authenticity and practicality. Constructing, scoring, interpreting, and evaluating second language tests for a variety of situations.

**ENGL 520: Computational Analysis of English**

(Cross-listed with HCI, LING). (3-0) Cr. 3.

*Prereq: ENGL 510 or LING 510, and ENGL 511 or LING 511*

Concepts and practices for analysis of English by computer with emphasis on the applications of computational analysis to problems in applied linguistics such as corpus analysis and recognition of learner language in computer-assisted learning and language assessment.

**ENGL 521: Teaching of Literature and the Literature Curriculum**

(3-0) Cr. 3.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Examination of the roles of the literary work, reader, and teacher in literary study. Responses to literature. Place of literature in language arts. Study and development of curriculum materials for middle school, high school, and college levels of instruction.

**ENGL 522: Literary Theory and Criticism**

(3-0) Cr. 3.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Examination of the history of and/or recent trends in literary theory and criticism (e.g., postcolonialism, queer theory, disability studies).

**ENGL 523: Introduction to Old English Language and Literature**

(3-0) Cr. 3.

*Prereq: Course in medieval literature or history or history of the English language recommended*

Introductory study of Old English language and literature in prose and poetry, including extracts from Beowulf. Some attention to Anglo-Saxon culture.

**ENGL 524: Literacy: Issues and Methods for Nonnative Speakers of English**

(Cross-listed with LING). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theoretical and practical issues and techniques in the teaching of literacy in a variety of contexts, involving children and adults at basic skill levels and teens and adults in academic and vocational programs.

**ENGL 525: Research and Teaching of Second Language Pronunciation**

(Cross-listed with LING). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theoretical and practical issues and techniques in the teaching of second language pronunciation as it relates to other areas of language, especially listening and speaking skills. Topics will include segmental and suprasegmental features; intelligibility; pronunciation in language assessment; classroom, technology and individual instruction; and research issues. Topics will be relevant to those intending to teach or research in various contexts.

**ENGL 526: Technology for Language Learning**

(Cross-listed with LING). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or equivalent*

Theory, research, and practice in computer use for teaching nonnative speakers of English. Methods for planning and evaluating computer-based learning activities.

**ENGL 527: Discourse Analysis**

(Cross-listed with LING). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Methods and theoretical foundations for linguistic approaches to discourse analysis. Applications of discourse analysis to the study of texts in a variety of settings, including academic and research contexts.

**ENGL 528: English for Specific Purposes**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Issues and techniques in analyzing, teaching, and assessing English for specific purposes. Topics include theories of specific purpose language use, analysis of learner needs in target language contexts, and corpus-informed syllabus and materials development for teaching and assessment.

**ENGL 529: Content Management**

(3-0) Cr. 3.

*Prereq: Senior classification*

Strategies for developing and delivering multimodal content via online digital media. Focus on the principles of database design, interface development, usability testing, and collaborative content management within professional communication settings.

**ENGL 530: Technology and Oral Language**

(Cross-listed with LING). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENGL 219 or ENGL 511 or equivalent.*

Structure and description of oral language and discourse. How spoken language is linguistically described, analyzed, and taught for research and for education. Using technology to record, transcribe, and analyze spoken language at all levels of linguistic structure.

**ENGL 531: Topics in the Study of Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Intensive study of literary genres, periods, movements, or themes (e.g., The African American Novel, Allegory, Science Fiction).

**ENGL 532: American Literature to 1865**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected texts in American literature from Beginnings to the Civil War. Study may include Native American literature, the literature of European conquest, Colonial and Revolutionary periods, Early Republic, and Jacksonian Era, in critical and cultural contexts.

**ENGL 533: British Literature to 1830**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected texts from the Medieval, Renaissance, Restoration, Eighteenth-Century, and/or Romantic periods, in critical and cultural contexts.

**ENGL 534: American Literature 1865 to the Present**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected texts in American literature from the Civil War to the present. Study may include Realism, Naturalism, Modernism, and Postmodernism, with significant attention to race/ethnicity, gender, and identity, and to contemporary critical views. Range of authors and genres.

**ENGL 535: British Literature 1830 to the Present**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected texts from the Victorian, Edwardian, Modernist, and/or Contemporary periods, in critical and cultural contexts.

**ENGL 536: Preparing Publishable Thesis Chapters**

(Cross-listed with GR ST). Cr. 3. F.S.

Reporting original research results within the norms for writing of a student's discipline. Emphasis on preparing thesis/dissertation chapters that will be both acceptable to the Graduate College and ready for submission to a refereed journal in the student's discipline. Focus on reporting results from student-generated original research, norms for discourse within disciplines, and how thesis chapters differ from journal manuscripts.

**ENGL 537: Corpus Approaches to Grammatical Analysis**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: ENGL 220 or LING 220; ENGL 219, LING 219, ENGL 511, LING 511, or introductory course in linguistics; graduate classification*

Corpus-informed analysis of syntax in authentic writing and speech, with emphasis on approaches used in applied linguistics.

**ENGL 538: Fiction**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected fiction writers in English; range of authors and genres. Emphasis on both male and female writers; attention to the relationships between fiction and cultural change.

**ENGL 539: Poetry**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Selected poets writing in English, considered in representative groups.

**ENGL 540: Drama**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Primary texts in dramatic genres from various literary periods, in critical and cultural contexts. Frequently concentrates on the English Renaissance and the Shakespearean stage.

**ENGL 542: Technical Editing and Publication Management**

(3-0) Cr. 3.

*Prereq: Senior classification*

Overview of theory and research in technical editing and publication management with substantial practice in applying theory and research findings. Focus on document production process, levels of edit, development of accessible, translatable, and inclusive documents, and sustainable publication practices.

**ENGL 543: The Study of Environmental Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification*

Intensive study of environmental literary genres, periods, figures, movements, or themes: e.g., Ecofeminism, Imagining Natural Disaster, Material Ecocriticism, Environmental Justice, Posthumanism.

**ENGL 545: Women's Literature**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Primary texts by women writers; historical, thematic, formal, or theoretical approaches; secondary readings; e.g., Nineteenth-Century Women Writers; American Women's Personal Narratives; Southern Women Writers of the U.S.

**ENGL 546: Issues in the Study of Literature**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Intensive study of current and emerging topics and problems concerning literature and its relationship to theory and to language study; e.g., Theory of Metaphor; Renegotiating the Canon; Feminist Theory.

**ENGL 547: The History of Rhetorical Theory from the Classical Era to the Present**

(Cross-listed with SP CM). (3-0) Cr. 3.

*Prereq: 6 credits in English*

Rhetorical theory from the classical period of ancient Greece through to the 20th century; attention to rhetoric's relation to the nature of knowledge, communication, practice, and pedagogy.

**ENGL 548: Cultural and Critical Theories of Communication and Rhetoric**

(Cross-listed with SP CM). (3-0) Cr. 3.

*Prereq: 6 credits in English*

Contemporary theories that address the production, reception, and critical evaluation of cultural artifacts and communicative events; these theories address power, ideology, and the norms of public discourse. Theories covered may include Postmodernism, Feminist Theory, Public Sphere Theory, as well as Critical Race Theory, Social Justice Theory, Disability Theory, Queer Theory, and/or Intercultural Theories of Communication and Rhetoric.

**ENGL 549: Multimedia and Interaction Design**

(Cross-listed with SP CM). (3-0) Cr. 3.

*Prereq: Senior classification*

Rhetorical principles of interactive multimedia design, such as those in streaming multimedia as part of workplace documents. Practical understanding of the computer applications used in interactive multimedia development. Focus on theoretical and practical elements of producing multimedia for training in both education and industry. Work with interactive hypertext, digital audio, and nonlinear video editing.

**ENGL 550: Creative Writing: Craft and Professional Practice**

(3-0) Cr. 3. F.

*Prereq: Admission into MFA Program in Creative Writing and Environment*

A multigenre craft course required of all incoming students in the MFA Program in Creative Writing and Environment. Students develop an understanding of craft and environmental writing across genres (poetry, fiction, nonfiction, drama), as well as learn about editing and publication practice through the lens of a working literary magazine, Flyway: A Journal of Writing and Environment. Other course activities may include an environmental field trip, presentations on the production practices of leading literary journals, individual editing projects, and pragmatic guidance for finding publication outlets for polished creative work.

**ENGL 551: Master Workshop**

(3-0) Cr. 3. F.

*Prereq: Fifth-semester or equivalent standing in MFA Program in Creative Writing and Environment.*

An advanced multigenre creative writing workshop. Students work intensively on book-length manuscripts of fiction, creative nonfiction, scriptwriting, or poetry.

**ENGL 552: Workshop: Scriptwriting**

(3-0) Cr. 3. Repeatable.

*Prereq: Graduate classification. Open to graduate students outside MFA Program in Creative Writing and Environment with permission of instructor.*  
Individual projects in dramatic writing. Focus on writing for stage, screen, and/or new media. Readings in dramatic literature. Discussion of elements such as plot, character, dialogue, structure, theme, and visual storytelling.

**ENGL 554: Workshop: Fiction**

(3-0) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Graduate classification. Open to graduate students outside MFA Program in Creative Writing and Environment with permission of instructor.*  
Individual projects in fiction on a workshop and conference basis. Readings in short fiction. Discussion of elements of narrative such as plot, point of view, characterization, theme, setting.

**ENGL 555: Workshop: Nonfiction**

(3-0) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Graduate classification. Open to graduate students outside MFA Program in Creative Writing and Environment with permission of instructor.*  
Individual projects in memoir, immersion journalism, character studies, and/or the personal essay on a workshop and conference basis. Readings in creative nonfiction.

**ENGL 556: Workshop: Poetry**

(3-0) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Graduate classification. Open to graduate students outside MFA Program in Creative Writing and Environment with permission of instructor.*  
Individual projects in poetry on a workshop and conference basis. Readings in poetry. Discussion of poetic elements such as image, sound, internal structure, rhythm, tone, figurative language.

**ENGL 557: Studies in Creative Writing**

(3-0) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Graduate classification. Open to graduate students outside MFA Program in Creative Writing and Environment with permission of instructor.*  
Special topics course on ideas, issues, and techniques in creative writing. Subject matter may include specific genres, aspects of the creative writing process, or themes of particular interest. Significant readings and written work required; previous workshop experience helpful.

**ENGL 558: Teaching Creative Writing**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Pedagogical approaches that are effective for grade-school through adult-education creative writing teaching. Writing exercises, workshops, text evaluation, and visits from creative writers.

**ENGL 559: Creative Writing Teaching Internship**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor.*

Students assist in an introductory creative writing course, primarily evaluating manuscripts and facilitating workshops. Some students may facilitate community-based creative writing workshops.

**ENGL 560: Environmental Field Experience**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 550 and graduate classification.*

Students spend a term on a project that requires fieldwork. Projects might include working for a federal, state, or private non-profit environmental organization or farm, or living and working in a specified natural area.

**ENGL 561: Methods for Scholarship in Literature and the Humanities**

Cr. 3.

*Prereq: Graduate classification or permission from the instructor*

Intensive study of research methods and perspectives concerning the study of literature and the humanities at the master's level. Introduction to resources and techniques of research, the structure of academic articles, and strategies for argument in academic communication.

**ENGL 562: Topics in the Study of Film**

Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq: Graduate classification or 6 credits in film at 300 level or above*

Intensive study of cinematic genres, periods, movements, or themes; e.g., The Musical, Classical Hollywood Cinema, Structural Film, Art and Cinema. General emphasis will be on American, British, and other Anglophone cinemas.

**ENGL 563: Research Methods in Rhetoric, Composition, and Professional Communication**

(3-0) Cr. 3. S.

*Prereq: Senior classification*

A workshop for graduate students in rhetoric and professional communication. Focus on rhetorical analysis, qualitative methods, or quantitative methods.

**ENGL 563A: Research Methods in Rhetoric, Composition, and Professional Communication: Qualitative Research**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Senior classification*

Theory and application of qualitative communication research, including research design, data collection, ethical issues, data analysis, and reporting results.



**ENGL 563B: Research Methods in Rhetoric, Composition, and Professional Communication: Quantitative Research**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Senior classification*

Application of quantitative research designs, such as surveys and experiments; data collection techniques; essential statistical analyses; and write-up of results. Develop ethical research practices for human subjects research. Analyze quantitative research design principles in professional communication studies.

**ENGL 563C: Research Methods in Rhetoric, Composition, and Professional Communication: Rhetorical Analysis**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Senior classification*

Extended practice in close textual analysis of various kinds of rhetorical artifacts. Attention to important theoretical concepts used in rhetorical analysis and to historical controversies over the scope and function of rhetorical analysis.

**ENGL 569: Grant Writing**

(Cross-listed with GR ST). (1-0) Cr. 1. S.

*Prereq: at least two prior years of graduate classification.*

Writing a winning proposal.

**ENGL 586: Visual Rhetoric in Professional Communication**

(3-0) Cr. 3.

*Prereq: A course in professional communication*

Rhetorical theory and research in graphics, document design, and related principles of visual communication. Methods of designing texts, data displays, illustrations, and other visual elements in business and technical communication.

**ENGL 587: Internship in Professional Communication**

(3-0) Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Three graduate credits in professional communication, permission of instructor. Limited to master's and doctoral degree candidates in the field of rhetoric and professional communication*

An opportunity to write, edit, and design documents in a professional setting.

**ENGL 588: Supervised Practice Teaching in Teaching English as a Second Language**

(Cross-listed with LING). (1-5) Cr. 3. F.S.

*Prereq: 9 credits toward the TESL/TEFL Certificate or 15 credits toward the TESL/AL master's degree.*

Intensive observation of ESL instruction and supervised practice in teaching learners of English in a context appropriate to the student teacher's goals. ENGL 588 cannot be used for teacher licensure.

**ENGL 589: Supervised Practicum in Literary Editing**

(3-0) Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: ENGL 550 and permission of instructor*

An opportunity to edit literary texts and gain experience in a literary publishing setting.

**ENGL 590: Special Topics**

(Cross-listed with LING). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590A: Special Topics: Literature**

Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590B: Special Topics: Teaching English as a Second Language (TESL)/Applied Linguistics**

(Cross-listed with LING). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590C: Special Topics: Composition and Rhetoric**

Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590E: Special Topics: Rhetoric and Professional Communication**

Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590F: Special Topics: Creative Writing**

Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 590G: Special Topics: Applied Linguistics and Technology**

(Cross-listed with LING). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**ENGL 591: Directed Readings**

Cr. arr. Repeatable.

**ENGL 591A: Directed Readings: Literature**

Cr. arr. Repeatable.

**ENGL 591B: Directed Readings: Teaching English as a Second Language (TESL)/Applied Linguistics**

(Cross-listed with LING). Cr. arr. Repeatable.

**ENGL 591C: Directed Readings: Composition and Rhetoric**

Cr. arr. Repeatable.



**ENGL 591E: Directed Readings: Rhetoric and Professional Communication**

Cr. arr. Repeatable.

**ENGL 591F: Directed Readings: Creative Writing**

Cr. arr. Repeatable.

**ENGL 591G: Directed Readings: Applied Linguistics and Technology**  
(Cross-listed with LING). Cr. arr. Repeatable.

**ENGL 592: Core Studies in Rhetoric, Composition, and Professional Communication**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**ENGL 592A: Core Studies: Rhetoric**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**ENGL 592B: Core Studies: Composition**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**ENGL 592C: Core Studies: Professional Communication**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**ENGL 595: Graduate Study and Travel**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 595A: Graduate Study and Travel: Literature**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 595B: Graduate Study and Travel: Creative Writing**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 595C: Graduate Study and Travel: Linguistics**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 595D: Graduate Study and Travel: Rhetoric and Professional Communication**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 595E: Graduate Study and Travel: Teacher Education**

Cr. arr.

*Prereq: Permission of instructor*

Supervised study of an appropriate area of the discipline while traveling in a foreign country or in the U.S. Special fees apply.

**ENGL 599: Creative Component**

Cr. 3. F.S.SS.

*Prereq: Graduate classification, permission of major professor*

**Courses for graduate students:**

**ENGL 603: Seminar in Composition Theory**

(3-0) Cr. 3.

*Prereq: ENGL 503*

Exploration of relationships between theory and practice in current pedagogy. Intensive examination of contemporary theories of poststructuralism, new media, feminism, postcolonialism, or cultural studies and their impact on current pedagogical practice. Participation in pedagogical research and theory building.

**ENGL 611: Seminar in Rhetorical Theory**

(Cross-listed with SP CM). (3-0) Cr. 3. Repeatable.

*Prereq: ENGL 547*

Rhetorical theory, criticism, and/or practice in relation to a historical period or a particular theoretical issue.

**ENGL 623: Research Methods in Applied Linguistics**

(Cross-listed with LING). (3-0) Cr. 3. Repeatable.

Survey of research methods used in applied linguistics. Focus on conceptualizing and conducting research studies, including the process of developing research questions, gathering data, choosing data collection measures, and coding and analyzing data. Examples from a range of research approaches in the journals in applied linguistics and related areas are evaluated. The course prepares students to be critical consumers of quantitative and qualitative applied linguistics research and able to design and carry out their own research studies.

**ENGL 623A: Research Methods in Applied Linguistics: Quantitative**

(Cross-listed with LING). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511*

Survey of quantitative research methods used in applied linguistics.

**ENGL 623B: Research Methods in Applied Linguistics: Qualitative**

(Cross-listed with LING). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 511 or LING 511*

Survey of qualitative research methods used in applied linguistics.

**ENGL 626: Computer-Assisted Language Testing**

(Cross-listed with LING). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 510 or LING 510, ENGL 511 or LING 511, ENGL 519 or LING 519*

Principles and practice for the use and study of computers and the Internet in second language assessment.

**ENGL 630: Seminar in Applied Linguistics**

(Cross-listed with LING). (3-0) Cr. 3. Repeatable.

*Prereq: ENGL 510 or LING 510, ENGL 511 or LING 511*

Topic changes each semester. Topics include advanced methods in natural language processing, technology and literacy in a global context, feedback in CALL programs, technology and pronunciation, and advances in language assessment.

**ENGL 631: Administration and Organization of Multimodal Writing Programs**

(3-0) Cr. 3.

*Prereq: ENGL 500, ENGL 503, ENGL 504, or ENGL 603*

Survey of the major components of writing instruction in academic and nonacademic settings. History, theory, organization, and evaluation of writing programs. Guided observation of writing program functions at various institutions and businesses.

**ENGL 699: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Graduate classification, permission of major professor*  
Research.

## Entomology (ENT)

***Any experimental courses offered by ENT can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**ENT 201: Introduction to Insects**

(2.7-0) Cr. 1. F.S.SS.

Biological and ecological aspects of insects. Offered online only. 5 weeks.

**ENT 211: Insects and Society**

(2.7-0) Cr. 2. F.S.

*Prereq: ENT 201*

The importance of insects in human well-being. Insect-human interactions. Primarily for non-science and non-agriculture majors. Offered online only. 11 weeks.

**ENT 214: Insects in Forensic Science**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to the use of insects as evidence in court and how they can assist in solving crimes. Topics covered include basic insect biology, systematics, behavior, with emphasis on applications of forensic entomology.

**ENT 220: Introduction to Forensic Science**

(Cross-listed with C J). (3-0) Cr. 3. S.

Study of fundamental forensic science techniques and procedures covering types of physical, chemical, and biological evidence and how this information is used in the legal system. Assessment of crime scenes and various forensic specialties will be introduced.

**ENT 283: Pesticide Application Certification**

(Cross-listed with AGRON, FOR, HORT). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**ENT 358: Bee Biology, Management, and Beekeeping**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq: 1 course in 200-level BIOL or Permission of Instructor*

Bee diversity and evolution, ecology, role as pollinators, behavior, anatomy, and development. Management of bees as agricultural pollinators and honey producers, focusing on honey bees. Working with live bee hives and demonstration of practical beekeeping skills will occur during several field trips to local hives.

**ENT 370: Insect Biology**

(2-3) Cr. 3. F.

*Prereq: BIOL 101 or BIOL 211*

Structure, physiology, evolution, behavior, life histories, and recognition of insects. Collection required.

**ENT 372: Livestock Entomology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

Classroom and off-campus videotape sections. 12 weeks. Recognition, biology, behavior, economic importance, and management of insects and other arthropods affecting livestock and poultry production.

**ENT 374: Insects and Our Health**

(Cross-listed with MICRO). (3-0) Cr. 3. S.

*Prereq: 3 credits in BIOL*

Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease.

Meets International Perspectives Requirement.

**ENT 374L: Insects and Our Health Laboratory**

(Cross-listed with MICRO). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Credit or concurrent enrollment in ENT 374 or MICRO 374*

Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**ENT 375: Plant Protection Using Natural Enemies**

(Dual-listed with ENT 575). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENT 370 or ENT 376*

Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies.

**ENT 376: Fundamentals of Entomology and Pest Management**

(2-3) Cr. 3. S.

*Prereq: BIOL 101 or BIOL 211*

Introduction to entomology and insect-pest management, including life processes, ecology, economics, tactics of population suppression, and ecological backlash.

**ENT 425: Aquatic Insects**

(Dual-listed with ENT 525). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 435: Entomology Field Trip**

(Cross-listed with A ECL). Cr. 2. Repeatable, maximum of 2 times. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: BIO 312; Permission of Instructor*

Field trip to study insects of major terrestrial and aquatic ecosystems. Location and duration vary. ENT 370 or ENT 425 recommended.

**ENT 450: Pesticides in the Environment**

(Dual-listed with ENT 550). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENT 452: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with ENT 552). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 471: Insect Ecology**

(Dual-listed with ENT 571). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 211 or Permission of Instructor*

The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

A maximum of 9 credits of all (university-wide) 490 credits may be applied toward graduation.

**ENT 490E: Independent Study: Research or work experience.**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

A maximum of 9 of all (university-wide) 490 credits may be used toward graduation.

**ENT 490U: Independent Study: Laboratory teaching experience**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

For students registering to be undergraduate laboratory assistants. A maximum of 9 of all (university-wide) 490 credits may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:****ENT 511: Integrated Management of Tropical Crops**

(Cross-listed with HORT, PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems.

Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects.

Meets International Perspectives Requirement.

**ENT 525: Aquatic Insects**

(Dual-listed with ENT 425). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BIOL 312*

Morphology, ecology, diversity, and significance of aquatic insects, with emphasis on the collection, curation and identification of taxa in local streams and lakes.

**ENT 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, PL P, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**ENT 550: Pesticides in the Environment**

(Dual-listed with ENT 450). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**ENT 552: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with ENT 452). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**ENT 555: Insect Physiology**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq: ENT 370*

Life processes of the insects, including reviews of current problems in insect physiology.

**ENT 568: Advanced Systematics**

(Cross-listed with EEOB). (2-3) Cr. 3. Alt. S., offered irregularly.

*Prereq: Permission of instructor*

Principles and practice of systematic biology; taxonomy, nomenclature and classification of plants and animals; sources and interpretation of systematic data; speciation; fundamentals of phylogenetic systematics.

**ENT 570: Plant-Insect Interaction**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in biological sciences*

Physiological, behavioral, ecological, and evolutionary factors that govern interactions between insects and plants, applications of this knowledge to agriculture, and important results from the study of natural systems. Additional topics covered during the semester include: tritrophic interactions, biological control of plants by insects, and pollination biology. Student-led discussions and draws on both the primary and secondary literature.

**ENT 571: Insect Ecology**

(Dual-listed with ENT 471). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 211 or Permission of Instructor*

The contribution of insects to ecosystem function is staggering. This course will focus on insect population ecology, predator-prey interaction and chemical ecology. The role of insects in nutrient cycling, pollination and pest management will be discussed with case studies used to highlight the applied nature of insect ecology and its relationship to agriculture.

**ENT 574: Medical Entomology**

(3-3) Cr. 4. Alt. S., offered even-numbered years.

*Prereq: 9 credits in biological sciences*

Identification, biology, and significance of insects and other arthropods that attack people and animals, particularly those that are vectors of disease.

**ENT 575: Plant Protection Using Natural Enemies**

(Dual-listed with ENT 375). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENT 370 or ENT 376*

Overview of the biology, ecology, and classification of insect pathogens, predators, and parasitoids. Discussion of the use of these organisms in plant protection, including an emphasis on genetic alteration of natural enemies.

**ENT 576: Systematic Entomology**

(3-6) Cr. 5. Alt. F., offered even-numbered years.

*Prereq: ENT 370*

Classification, distribution, and natural history of insects, including fundamentals of phylogenetic systematics, biogeography, taxonomic procedures, and insect collection and curation.

**ENT 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with AGRON, HORT, PL P). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**ENT 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: 15 credits in biological sciences.*

**ENT 590A: Special Topics: Biological Control and Pathology.**

Cr. 1-3. Repeatable.

**ENT 590B: Special Topics: Chemical Ecology and Behavior.**

Cr. 1-3. Repeatable.

**ENT 590C: Special Topics: Ecology and Pest Management.**

Cr. 1-3. Repeatable.

**ENT 590D: Special Topics: Evolution and Systematics.**

Cr. 1-3. Repeatable.

**ENT 590E: Special Topics: Special Research Topics.**

Cr. 1-3. Repeatable.

**ENT 590F: Special Topics: Medical and Veterinary Entomology.**

Cr. 1-3. Repeatable.

**ENT 590G: Special Topics: Molecular Entomology.**

Cr. 1-3. Repeatable.

**ENT 590I: Special Topics: Toxicology**

Cr. 1-3. Repeatable.

**ENT 590K: Special Topics: Teaching Experience.**

Cr. 1-3. Repeatable.

**ENT 590L: Special Topics: Extension Internship.**

Cr. 1-3. Repeatable.

**ENT 590M: Special Topics: Immature Insects.**

Cr. 1-3. Repeatable.

**ENT 590N: Special Topics: Population Genetics.**

Cr. 1-3. Repeatable.

**Courses for graduate students:****ENT 600: Seminar**

Cr. 1. F.S.SS.

Presentation of research results.

**ENT 675: Insecticide Toxicology**

(Cross-listed with TOX). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENT 555 or TOX 501*

Principles of insecticide toxicology; classification, mode of action, metabolism, and environmental effects of insecticides.

**ENT 699: Research**

Cr. arr. Repeatable.

## Entrepreneurship (ENTSP)

***Any experimental courses offered by ENTSP can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****ENTSP 310: Entrepreneurship and Innovation**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Introduction to the entrepreneurial process, from the creation and discovery of entrepreneurial opportunities to starting viable business ventures. Develops core entrepreneurial and innovation skills instrumental for business startups as well as for established businesses, and fosters fundamental understanding of how to organize, structure, finance, market and launch new ventures. Opportunities to apply introduced skills, tools and frameworks through class projects and exercises.

**ENTSP 313: Feasibility Analysis for New Ventures**

(3-0) Cr. 3. F.S.

*Prereq: ENTSP 310*

Focuses on the knowledge and practical skills required for developing an idea for a new business venture, researching potential markets, analyzing competition, conducting formal feasibility analyses, and considering business plan implications. Includes discussion of basic business functions in terms of their application to conducting feasibility analyses and to exploiting related business opportunities.

**ENTSP 320: Corporate Entrepreneurship**

(Cross-listed with MGMT). (3-0) Cr. 3. F.S.

*Prereq: sophomore classification*

Introduces entrepreneurial approaches aimed at the identification, development and exploitation of technical and organizational innovations, the management of new product or process developments, and the effective management of new ventures. Focuses on mid-size to large corporations, especially in the manufacturing and service industries. Develops an awareness and understanding of the range, scope, and complexity of issues related to the creation of a corporate environment that is supportive of entrepreneurial endeavors as well as the effective implementation of technological and organizational innovations in corporate settings.

**ENTSP 367: International Entrepreneurship**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Introduces the essentials of two key components of international entrepreneurship: operating an entrepreneurial firm in an international environment, and starting and developing a new venture in an international market. Topics include choosing and entering an international market, organizing international ventures, and other issues related to managing the business and employees in an international context. Offers students the opportunity to create an international business plan for their own business idea or an existing company. Meets International Perspectives Requirement.

**ENTSP 381: Managing Family Businesses**

(Cross-listed with MGMT). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Introduction to the important role family businesses play in the domestic and global economies as well as the complex and unique challenges and opportunities encountered by such businesses and their family members and other employees. Explores best practices for successfully managing family businesses.

**ENTSP 410: Social Entrepreneurship**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Introduces the role of entrepreneurship in helping to solve social issues and societal problems, and the idea of social entrepreneurs as pursuers of the public good and as change agents in the social sector. Emphasis on how entrepreneurial topics such as innovation and opportunity recognition can be leveraged to address social problems, as well as on the planning and launch of new non-profit or not-for-profit ventures.

**ENTSP 431: Small Business Finance Decisions**

(Cross-listed with FIN). Cr. 3. S.

*Prereq: FIN 310 or ENTSP 313 AND FIN 301*

Integrative nature of small business financial decisions, from basic historical financial analysis to financial projections and valuation unique to small business. Utilize planning/valuation to reconcile the optimal exit date for the small business owner. Examination of this integrative approach through case study. Emphasis on practical application with a decision orientation. Group project working with a small business owner and related advisors/bankers to develop a plan that focuses on an optimal exit strategy.

**ENTSP 454: Entrepreneurial Marketing**

(Cross-listed with MKT). (3-0) Cr. 3. F.

*Prereq: MKT 340*

Basic understanding of marketing for those interested in creating or working for a start-up or an innovation-oriented company or consultancy. Relevant to marketing roles in entrepreneurial firms across both B2B and B2C markets. Integrates theory and practice, and provides insight into how entrepreneurs take both strategic and tactical marketing decisions in uncertain business environments. For hands-on perspective, incorporates projects involving real-world marketing problems confronting start-ups, and guest talks from entrepreneurs and frequent case analyses.

**ENTSP 461: Entrepreneurship and Accounting Information**

(Cross-listed with ACCT). (3-0) Cr. 3.

Accounting information recording, dissemination, and use by entrepreneurs. Introduces pro forma financials, venture capital, private equity, and state and federal regulations for business creation and formation. Other topics include intrapreneurship, intellectual property, information privacy, cybersecurity, and internal controls, including managing the risk of embezzlement.

**ENTSP 480: Applied Entrepreneurship: Executing New Ventures**

(3-0) Cr. 3.

*Prereq: ENTSP 310; ENTSP 313*

Focuses on application-oriented and experiential learning of best practices for starting and advising new business ventures. Students identify, propose and attempt to execute an experiential learning project, such as developing and presenting a business model for a new venture, launching a new venture, or similar entrepreneurial experience. Requires extensive work outside the classroom.



**ENTSP 485: Trends in Entrepreneurship**

(3-0) Cr. 3. F.S.SS.

*Prereq: ENTSP 310*

A broad examination of historical, literary, and business perspectives on entrepreneurship. The entrepreneurial process is studied by examining the role of individuals, new ventures, and established organizations in the discovery, evaluation, and exploitation of economic opportunities. Emphasis is placed on tracing the evolution of entrepreneurship theories over time, as well as analyzing current trends related to the study of entrepreneurship.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ENTSP 566: Entrepreneurship and New Venture Startup**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor.*

The essentials of starting and operating a new business. Topics include current research on entrepreneurial perspective, starting and developing a new business, financing the venture, managing the growing firm, and special issues.

**ENTSP 567: Launching International Ventures**

(3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Essentials of operating international ventures. Topics include identifying and evaluating international business opportunities, choosing among international markets and modes of international entry, building an international organization, managing across cultures, financing international ventures, and recognizing the major issues related to starting a venture in a non-US context. International entry plan for an international new venture or an existing business.

**ENTSP 583: Formulating and Implementing Innovation Strategies**

(Cross-listed with MGMT). (3-0) Cr. 3.

*Prereq: MGMT 504 or permission of instructor*

Key strategies, models, and tools to foster and drive organizational innovation. Analysis of industry dynamics, sources and types of innovations, timing of entry; formulation of innovation strategies; developing innovation portfolios and collaboration strategies, protecting innovation; implementing technological innovation strategy, including new product development and deployment strategy. Essential traits of innovative strategic leaders. Critical analysis and discussion of cases focused on entrepreneurship and innovation and project requiring hands-on practical application of course concepts.

**Courses for graduate students:**

**ENTSP 605: Seminar in Strategic Management**

(Cross-listed with MGMT). Cr. 3. Alt. F., offered odd-numbered years.

Critical review of theory and research in the field of strategic management. Introduction to representative conceptual and empirical research. Review theories that provide the foundation for management research, and review current research in associate research streams. The review will cover fundamental questions in strategy.

**ENTSP 606: Historical Foundations of Entrepreneurship Research**

(Cross-listed with MGMT). Cr. 3.

*Prereq: Enrollment in the PhD Program*

Seminal readings, theoretical perspectives, and historical roots of Entrepreneurship research. A broad variety of core foundational theories, perspectives, and approaches are discussed.

**ENTSP 607: Current Topics in Entrepreneurship Research**

(Cross-listed with MGMT). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in the doctoral program*

Current theoretical perspectives and methodological approaches in entrepreneurship research. Current entrepreneurship research is inherently interdisciplinary such that we will draw on insights from scholars across a range of disciplines.

**ENTSP 609: Organizational Research Methods**

(Cross-listed with MGMT). Cr. 3. F.

*Prereq: Enrollment in ENTSP or MGMT PH D program or permission of instructor.*

Solid methodological foundation that will prepare you to be a productive producer and educated consumer of scientific research in the field of Management, Entrepreneurship, and other related disciplines. Introduction to numerous concepts and techniques with relevance to your future scholarship in this domain. Conceptual underpinnings necessary to appreciate the strengths and limitations of various approaches used in these fields and the interplay between theoretical advancement and rigorous empirical investigation.

## Environmental Engineering (ENV E)

**Any experimental courses offered by ENV E can be found**

**at:** [registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**ENV E 120: Environmental Engineering Learning Community**

(1-0) Cr. 1. F.

Integration of first-year students into the Environmental Engineering program. Assignments and activities involve personal and leadership skill development, teamwork, academic planning and career readiness. Completed both individually and in learning teams under the direction of instructors and peer mentors.

### **ENV E 190: Introduction to Undergraduate Research in Civil and Environmental Engineering**

(Cross-listed with C E). Cr. 2. Repeatable, maximum of 4 times.

*Prereq: Permission of Instructor*

Introduction to research, focusing on sub-disciplines of civil and environmental engineering. Research questions, hypotheses, literature reviews, experimental design, data collection, data analysis, and presentation. Topics chosen to introduce students to water resources, environmental engineering, transportation engineering, geotechnical/materials engineering, or structural engineering. Repeatable but only two credits may count toward graduation in C E

### **ENV E 201: Environmental Engineering Measurements and Analysis**

(2-2) Cr. 3. F.

*Prereq: C E 190*

Introduction to environmental monitoring, environmental field and laboratory sampling, sample preservation and chain of custody, quality assurance and quality control, measurements of common chemical and biological components in different media, and analysis of environmental quality in natural and engineered systems. Concentrations and material balances concepts as applied to environmental engineering. Laboratory testing and experiments.

### **ENV E 326: Principles of Environmental Engineering**

(Cross-listed with C E). (2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in A B E 378; (CHEM 167 or CHEM 177); CHEM 178; MATH 166*

Introduction to environmental problems, water quality indicators and requirements, potable water quality and quantity objectives, water sources and treatment methods; water pollution control objectives and treatment methods; survey of solid and hazardous waste management and air pollution control.

### **ENV E 426: Environmental Engineering Science**

(2-2) Cr. 3. F.

*Prereq: C E 326; CHEM 231; MICRO 201*

Physical, chemical and biological principles related to environmental engineering and management. Topics include physical principles (mass transfer, mass balances, reactor systems), chemical principles (kinetics and equilibrium, acid-base, redox and precipitation), and biological principles (common environmental microbial processes, microbiology). Laboratory testing and experiments. ENV E 201 recommended.

### **ENV E 427: Environmental Engineering Systems**

(3-0) Cr. 3. S.

*Prereq: MATH 265; MATH 266; C E 326; C E 372*

Integrated systems and modeling-based evaluation of natural and engineered environments including water, soil, and air. Exploration of public health outcomes and risk assessment in environmental engineering. Analysis of socio-environmental systems.

### **ENV E 428: Water and Wastewater Treatment Plant Design**

(Cross-listed with C E). (3-0) Cr. 3. S.

*Prereq: C E 326*

Physical, chemical and biological processes for the treatment of water and wastewater including coagulation and flocculation, sedimentation, filtration, adsorption, chemical oxidation/disinfection, fixed film and suspended growth biological processes and sludge management. Design project.

### **ENV E 429: Air Pollution and Control**

(3-0) Cr. 3. S.

*Prereq: MATH 265; C E 326*

Coverage of air pollution topics such as stationary and mobile sources, National Ambient Air Quality Standards, regional and global air pollution concerns (acid rain, ozone depletion, greenhouse gases), indoor air pollution, air pollution meteorology, air pollutant dispersion, and air pollution control equipment.

### **ENV E 430: Solid and Hazardous Waste Management**

(3-0) Cr. 3. F.

*Prereq: C E 326; credit or concurrent enrollment in C E 426*

Evaluation, characterization, assessment, planning and design of solid and hazardous waste management systems, regulatory requirements, material characterization and collection, minimization and recycling, energy and materials recovery, composting, off-gas treatment, incineration, stabilization, and landfill design. Design of treatment and disposal systems for solid and hazardous wastes, including physical, chemical, and biological treatment, solidification, incineration, secure landfill design, and final disposal site closure plus restoration.

### **ENV E 490: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in environmental or water resources engineering. Pre-enrollment contract required. Maximum of 3 credits may be counted towards Engineering Topics Electives.

## **Environmental Science (ENSCI)**

***Any experimental courses offered by ENSCI can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

### **ENSCI 110: Orientation to Environmental Science**

(1-0) Cr. 1. F.

*Prereq: Freshman classification; major in Environmental Science*

Overview of Environmental Science curriculum and discussion of professional opportunities. Offered on a satisfactory-fail basis only.

**ENSCI 201: Introduction to Environmental Issues**

(Cross-listed with BIOL, ENV S). (2-0) Cr. 2. F.

Discussion of current and emerging environmental issues such as human population growth, energy use, loss of biodiversity, water resources, and climate change.

**ENSCI 202: Exploration of Environmental and Sustainability Issues**

(1-0) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in ENSCI 201*

Exploration of specific environmental and sustainability issues; designed to complement ENSCI 201.

**ENSCI 203: Exploration of Environmental Science**

(1-0) Cr. 1. S.

*Prereq: ENSCI 202*

Continued exploration of specific environmental science issues developed in ENSCI 202. Topics may vary in different years.

**ENSCI 250: Environmental Geography**

(Cross-listed with AGRON, ENV S, NREM). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

**ENSCI 251: Biological Processes in the Environment**

(Cross-listed with BIOL). (3-0) Cr. 3. S.

Principles of Biology from the level of macromolecules to the biosphere. Biological processes that affect environmental systems: including metabolism, energy pathways, biochemical reactions in cells, plant and microbial structure and function, element and water cycles.

**ENSCI 270: Geospatial Technologies**

(Cross-listed with AGRON). Cr. 3. S.

Concepts and tools for acquiring, managing, analyzing, and displaying geographic information, including GIS, remote sensing, spatial analysis, and cartography. Focus on applications in biological, ecological, environmental, and agricultural sciences.

**ENSCI 301: Natural Resource Ecology and Soils**

(Cross-listed with NREM). (3-3) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L; (FOR 201 or a second course in biology)*

Effects of environmental factors on ecosystem structure and function using forest, prairie and agricultural ecosystems as models. Special emphasis is given to soil-forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics. Additional emphasis is given to human influences on natural ecosystems and the role of perennial plant communities in agricultural landscapes.

**ENSCI 312: Ecology**

(Cross-listed with A ECL, BIOL). (3-3) Cr. 4. F.SS.

*Prereq: BIOL 211; (BIOL 212 or BIOL 251)*

Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Laboratory and field exercises examine ecological principles and methods as well as illustrate habitats.

**ENSCI 318: Introduction to Ecosystems**

(Cross-listed with AGRON, BIOL, NREM). (3-0) Cr. 3. S.

*Prereq: 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**ENSCI 319: Analysis of Environmental Systems**

(Cross-listed with BIOL, ENV S). Cr. 3. S.

*Prereq: ENSCI 312; Junior classification*

Systems approach to the analysis and modeling of material and energy flows in natural and managed environmental systems and the primary environmental factors controlling these systems. Applications in hydrology, biogeochemistry, and population dynamics.

**ENSCI 324: Energy and the Environment**

(Cross-listed with ENV S, GEOL, MTEOR). (3-0) Cr. 3. S.

*Prereq: CHEM 163 or CHEM 167 or CHEM 177*

Exploration of the origin of Earth's energy resources and the environmental and climatic impacts of energy acquisition and consumption. Renewable and non-renewable energy resources within an Earth-system context. Various environmentally-relevant topics such as water quality and availability, habitat destruction, greenhouse-gas emissions, and health and safety hazards to wildlife and human communities.

**ENSCI 345: Natural Resource Photogrammetry and Geographic Information Systems**

(Cross-listed with NREM). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Measurement and interpretation of aerial photos in resource management. Introduction to Geographic Information Systems (GIS) using ArcGIS including digitizing, development and query of attribute tables, georeferencing, and use of multiple GIS layers in simple spatial analyses.

**ENSCI 360: Environmental Soil Science**

(Cross-listed with AGRON). (3-0) Cr. 3. S.

Application of soil science to contemporary environmental problems; comparison of the impacts that different management strategies have on short- and long-term environmental quality and land development. Emphasis on participatory learning activities. AGRON 182 or ENSCI 250 or GEOL 101 recommended.

**ENSCI 370: GIS for Ecology and Environmental Science**

(Cross-listed with BIOL). Cr. 1-6. Repeatable. F.S.

*Prereq:* Six credits in biological and /or physical sciences, and permission of instructor.

Introduction to geographic information systems (GIS) with emphasis on ecological and environmental applications. No prior GIS experience required. Guided, individualized study of topics based on student background and interest. For students with prior experience, topics and activities are selected to build upon any previous experience and minimize duplication to previous GIS coursework. Potential topics include: basic concepts of GIS, data structures, database management, spatial analysis, modeling and visualization of ecological and environmental data. Case studies in ecological and environmental applications using ArcGIS. Offered on a satisfactory-fail basis only.

**ENSCI 375: Marine Ecology and Ecosystems Dynamics**

(Cross-listed with A ECL, BIOL). (3-0) Cr. 3. S.

*Prereq:* BIOL 211

Overview of the ecological processes, ecosystems, and biodiversity in marine environments. Ever-changing dynamics caused by environmental disturbances, internal forces, or by human impacts on species and ecosystems.

**ENSCI 390: Internship in Environmental Science**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* Department Permission

Supervised off-campus work experience in the field of environmental science. Offered on a satisfactory-fail basis only.

**ENSCI 391: Apprenticeship**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* Department Permission

Practical experience in an approved setting such as a research laboratory, government office, or private office. Offered on a satisfactory-fail basis only.

**ENSCI 402: Watershed Hydrology**

(Dual-listed with ENSCI 502). (Cross-listed with GEOL, MTEOR, NREM).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**ENSCI 404: Global Change**

(Dual-listed with ENSCI 504). (Cross-listed with AGRON, ENV S, MTEOR).

(3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**ENSCI 405: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with ENSCI 505). (Cross-listed with AGRON, MTEOR). (3-0) Cr.

3. Alt. S., offered odd-numbered years.

*Prereq:* MATH 160 or MATH 165

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**ENSCI 406: World Climates**

(Cross-listed with AGRON, MTEOR). (3-0) Cr. 3. S.

*Prereq:* AGRON 206 or MTEOR 206

Distribution and causes of different climates around the world. Effects of climate and climate variations on human activities including society, economy and agriculture. Current issues such as climate change and international efforts to assess and mitigate the consequences of a changing climate. Semester project and in-class presentation required. Meets International Perspectives Requirement.

**ENSCI 407: Watershed Management**

(Dual-listed with ENSCI 507). (Cross-listed with ENV S, NREM). (3-3) Cr. 4. S.

*Prereq:* 1 course in BIOL

Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

**ENSCI 409: Field Methods in Hydrogeology**

(Dual-listed with ENSCI 509). (Cross-listed with GEOL). (0-4) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq:* GEOL 402 or ENSCI 402 or GEOL 411 or ENSCI 411 or C E 473

Introduction to field methods used in groundwater investigations. In-field implementation of pumping tests, slug tests, monitoring well installation and drilling techniques, geochemical and water quality sampling, seepage meters, minipiezometers, stream gaging, and electronic instrumentation for data collection. Field trips to investigate water resource, water quality, and remediation projects.

**ENSCI 411: Hydrogeology**

(Dual-listed with ENSCI 511). (Cross-listed with GEOL). (3-2) Cr. 4. F. Physical principles of groundwater flow, nature and origin of aquifers and confining units, well hydraulics, groundwater modeling, and contaminant transport. Lab emphasizes applied field and laboratory methods for hydrogeological investigations.

**ENSCI 412: Micropaleontology**

(Cross-listed with GEOL). Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* GEOL 102; GEOL 102L

Evolution, identification and utility of major microfossil groups from the Mesozoic to present. Focus on Cenozoic applications including biostratigraphy, paleoclimate, and paleothermometry using assemblages, stable isotopes, Mg/Ca, and molecular fossils. Laboratory includes processing and analysis of specific microfossils. Major groups covered include foraminifera, calcareous nannofossils, sponge spicules, diatoms, radiolarians, and silicoflagellates.

**ENSCI 413: Applied and Environmental Geophysics**

(Dual-listed with ENSCI 513). (Cross-listed with C E, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**ENSCI 414: Applied Groundwater Flow Modeling**

(Dual-listed with ENSCI 514). (Cross-listed with GEOL). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* (C E 473 or GEOL 411); MATH 165

Introduction to the principles of modeling groundwater flow systems. Finite-difference and analytic-element methods, spreadsheet models, boundary conditions, calibration, sensitivity analysis, parameter estimation, particle tracking, and post-audit analysis. Application of MODFLOW to regional flow-system analysis. Computer laboratory emphasizes assigned problems that illustrate topics discussed in the course.

**ENSCI 415: Paleoclimatology**

(Dual-listed with ENSCI 515). (Cross-listed with GEOL). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to mechanisms that drive climate, including the interplay between oceanic and atmospheric circulation and fluctuation in Earth's orbital parameters. Examination and analysis of past climate records ranging from historical documentation to ecological and geochemical proxies (e.g. tree ring analysis; O and C isotopes of skeletal carbonates and soils). Dating methods used to constrain and correlate climatic periods; utility of computer models to reconstruct past climates and predict future climate change. Emphasis placed on paleoclimatology and paleoecology of the late Quaternary (last ~1 million years).

**ENSCI 416: Hydrologic Modeling and Analysis**

(Dual-listed with ENSCI 516). (Cross-listed with GEOL, MTEOR). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

Study of the basic principles of hydrologic modeling, including rainfall-runoff analysis, lumped and distributed modeling, conceptual and physical models, parameter estimation and sensitivity analysis, input and validation data, uncertainty analysis, and the use of models in surface water hydrology. A range of common models are applied to study hydrologic topics such as flood forecasting and land use change impacts. Previous experience with Matlab or other programming language is needed.

**ENSCI 418: Stream Ecology**

(Dual-listed with ENSCI 518). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* A ECL 486

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**ENSCI 419: Aqueous and Environmental Geochemistry**

(Dual-listed with ENSCI 519). (Cross-listed with GEOL). (2-2) Cr. 3. S.

*Prereq:* CHEM 178; CHEM 178L; Junior classification

Geochemistry of natural waters and water-rock interactions. Acid-base equilibria, carbonate chemistry and buffer systems, mineral dissolution and precipitation, sorption, ion exchange, and redox reactions. Introduction to thermodynamics and kinetics. Laboratory emphasizes chemical analysis of waters and computer modeling.



**ENSCI 420: Environmental Engineering Chemistry**

(Dual-listed with ENSCI 520). (Cross-listed with C E). (2-3) Cr. 3. F.

*Prereq:* C E 326; CHEM 178

Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters; including chemical equilibria, reaction kinetics, acid-base equilibria, chemical precipitation, redox reactions, and mass transfer principles. Individual laboratory practicals and group projects required.

**ENSCI 424: Air Pollution**

(Dual-listed with ENSCI 524). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 424A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with ENSCI 524A). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 424B: Air Pollution: Climate change and causes**

(Dual-listed with ENSCI 524B). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 424C: Air Pollution: Transportation Air Quality**

(Dual-listed with ENSCI 524C). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A

**ENSCI 424D: Air Pollution: Off-gas treatment technology**

(Dual-listed with ENSCI 524D). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B

**ENSCI 424E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with ENSCI 524E). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq:* (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 426: Stable Isotopes in the Environment**

(Dual-listed with ENSCI 526). (Cross-listed with GEOL). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to the theory, methods and applications of stable isotopes. Primary focus on the origin, natural abundance, and fractionation of carbon, hydrogen, oxygen, nitrogen isotopes. Applications of isotopic occurrence for elucidation of physical, chemical, biological, and environmental processes. Effects of plant physiology, photosynthesis, trophic structure, diffusion, evaporation, chemical precipitation, soil and atmospheric processes, and environmental factors on isotope abundance.

**ENSCI 446: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with ENSCI 546). (Cross-listed with NREM). (2-3) Cr. 3. F.

*Prereq:* 12 credits in student's major at 300 level or above

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**ENSCI 452: Intro GIS for Geoscientists**

(Dual-listed with ENSCI 552). (Cross-listed with AGRON, GEOL). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**ENSCI 459: Environmental Soil and Water Chemistry**

(Dual-listed with ENSCI 559). (Cross-listed with AGRON). (3-3) Cr. 4. F.

*Prereq:* 6 credit of CHEM; (AGRON 182 or AGRON 360); MATH 140

An introduction to the chemical properties of soils, chemical reactions and transformations in soils and surface waters, and their impact on the environment. Topics include solution chemistry in soils and surface waters, solid-phase composition of soils, reactions at the solid-solution interface, and applications to contemporary environmental issues. AGRON 354; GEOL 100 recommended.

**ENSCI 463: Soil Formation and Landscape Relationships**

(Dual-listed with ENSCI 563). (Cross-listed with AGRON). (3-0) Cr. 3. F.

Relationships between soil formation, geomorphology, and environment. Soil description, classification, geography, mapping, and interpretation for land use. Two weekend field trips. AGRON 182 or ENSCI 250 recommended. Credit for one of AGRON 463 or AGRON 463I may be applied for graduation.



#### **ENSCI 464: Wetland Ecology**

(Dual-listed with ENSCI 564). (Cross-listed with BIOL). (3-0) Cr. 3. S.

*Prereq: 15 credits in biological sciences.*

Ecology, classification, creation and restoration, and management of wetlands. Emphasis on North American temperate wetlands.

#### **ENSCI 466: Ecosystem Services**

(Dual-listed with ENSCI 566). (Cross-listed with NREM). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

#### **ENSCI 468: Applied Geostatistics for Geoscientists**

(Dual-listed with ENSCI 568). (Cross-listed with GEOL, MTEOR). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)*

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

#### **ENSCI 477: Soil Physics**

(Dual-listed with ENSCI 577). (Cross-listed with AGRON). (3-0) Cr. 3. S.

The physical soil system: the soil components and their physical interactions; transport processes involving water, air, and heat. AGRON 182 recommended.

#### **ENSCI 479: Surficial Processes**

(Dual-listed with ENSCI 579). (Cross-listed with GEOL). (2-3) Cr. 3. F.

The study of physical processes that shape Earth's surface. Topics include weathering, sediment transport, and landform genesis with emphasis on fluvial, glacial, hillslope, eolian, and coastal processes. Applications to engineering and environmental problems. Laboratory includes topographic map interpretation and local field trips.

#### **ENSCI 480: Engineering Analysis of Biological Systems**

(Cross-listed with A B E, GLOBE). (2-2) Cr. 3. F.

*Prereq: A B E 380 or Permission of Instructor*

Systems-level quantitative analysis of various biological systems, including applications in foods, feeds, biofuels, bioenergy, and other bio-based systems. Introduction to techno-economic analysis and life-cycle assessment of these systems at multiple production scales. Applying these tools to evaluate and improve cost and sustainability performance. Students enrolled in ABE 580 will be required to conduct additional learning activities.

#### **ENSCI 483: Environmental Biogeochemistry**

(Dual-listed with ENSCI 583). (Cross-listed with BIOL, GEOL). Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 12 credits in BIOL, CHEM, PHYS*

An exploration of biological, physical and geochemical impacts on the structure and function of ecosystems from local to global scales. Emphasis on the cycles of carbon, nitrogen, phosphorus, sulfur, and metals, and how these have been impacted by human activity. Topics may include biological feedbacks to climate change, microbial physiology and redox reactions, plant/soil feedbacks, terrestrial/aquatic linkages, early Earth processes and the origins of life.

#### **ENSCI 484: Ecosystem Ecology**

(Cross-listed with BIOL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Combined 12 credits in BIOL, CHEM, and PHYS*

Introduction of the study of ecosystems and the biological and physical factors that influence their properties and dynamics. Conceptual foundations for ecosystem studies. Interactions among organisms, biological diversity, and ecosystem attributes. Quantitative analyses of accumulations, transformations, and fluxes of nutrients, water, and energy within and among ecosystems. Global change issues.

#### **ENSCI 485: Soil and Environmental Microbiology**

(Dual-listed with ENSCI 585). (Cross-listed with AGRON, MICRO). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

#### **ENSCI 486: Aquatic Ecology**

(Dual-listed with ENSCI 586). (Cross-listed with A ECL, BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**ENSCI 486L: Aquatic Ecology Laboratory**

(Dual-listed with ENSCI 586L). (Cross-listed with A ECL, BIOL). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**ENSCI 487: Microbial Ecology**

(Dual-listed with ENSCI 587). (Cross-listed with BIOL, GEOL, MICRO). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**ENSCI 488: Raster GIS for Geoscientists**

(Dual-listed with ENSCI 588). (Cross-listed with AGRON, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**ENSCI 489: Survey of Remote Sensing Technologies**

(Dual-listed with ENSCI 589). (Cross-listed with E E, GEOL, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**ENSCI 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Department Permission*

**ENSCI 490H: Independent Study: Honors**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Department Permission*

Permission of instructor and approval of Environmental Science coordinator.

**ENSCI 495: Current Topics and Case Studies in Environmental Science**

Cr. 1-3.

*Prereq: Junior classification; major in Environmental Science; Permission of Instructor*

Current topics and case studies related to the analysis and management of environmental systems. Individual and/or group projects.

**ENSCI 496: Travel Course**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings. A. International Tour B. Domestic Tour.

**ENSCI 496A: Travel Course: International Tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings.

**ENSCI 496B: Travel Course: Domestic Tour**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings.

**ENSCI 498: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Department Permission*

Required of all cooperative education students. Students must register prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ENSCI 502: Watershed Hydrology**

(Dual-listed with ENSCI 402). (Cross-listed with GEOL, MTEOR, NREM). (2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**ENSCI 504: Global Change**

(Dual-listed with ENSCI 404). (Cross-listed with AGRON, MTEOR). (3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**ENSCI 505: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with ENSCI 405). (Cross-listed with AGRON, MTEOR). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MATH 160 or MATH 165*

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**ENSCI 509: Field Methods in Hydrogeology**

(Dual-listed with ENSCI 409). (Cross-listed with GEOL). (0-4) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: GEOL 402 or ENSCI 402 or GEOL 411 or ENSCI 411 or C E 473*

Introduction to field methods used in groundwater investigations. In-field implementation of pumping tests, slug tests, monitoring well installation and drilling techniques, geochemical and water quality sampling, seepage meters, minipiezometers, stream gaging, and electronic instrumentation for data collection. Field trips to investigate water resource, water quality, and remediation projects.

**ENSCI 511: Hydrogeology**

(Dual-listed with ENSCI 411). (Cross-listed with GEOL). (3-2) Cr. 4. F. Physical principles of groundwater flow, nature and origin of aquifers and confining units, well hydraulics, groundwater modeling, and contaminant transport. Lab emphasizes applied field and laboratory methods for hydrogeological investigations.

**ENSCI 513: Applied and Environmental Geophysics**

(Dual-listed with ENSCI 413). (Cross-listed with C E, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**ENSCI 514: Applied Groundwater Flow Modeling**

(Dual-listed with ENSCI 414). (Cross-listed with GEOL). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: (C E 473 or GEOL 411); MATH 165*

Introduction to the principles of modeling groundwater flow systems. Finite-difference and analytic-element methods, spreadsheet models, boundary conditions, calibration, sensitivity analysis, parameter estimation, particle tracking, and post-audit analysis. Application of MODFLOW to regional flow-system analysis. Computer laboratory emphasizes assigned problems that illustrate topics discussed in the course.

**ENSCI 515: Paleoclimatology**

(Dual-listed with ENSCI 415). (Cross-listed with GEOL). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to mechanisms that drive climate, including the interplay between oceanic and atmospheric circulation and fluctuation in Earth's orbital parameters. Examination and analysis of past climate records ranging from historical documentation to ecological and geochemical proxies (e.g. tree ring analysis; O and C isotopes of skeletal carbonates and soils). Dating methods used to constrain and correlate climatic periods; utility of computer models to reconstruct past climates and predict future climate change. Emphasis placed on paleoclimatology and paleoecology of the late Quaternary (last ~1 million years).

**ENSCI 516: Hydrologic Modeling and Analysis**

(Dual-listed with ENSCI 516). (Cross-listed with ENSCI, GEOL, MTEOR, MTEOR). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

Study of the basic principles of hydrologic modeling, including rainfall-runoff analysis, lumped and distributed modeling, conceptual and physical models, parameter estimation and sensitivity analysis, input and validation data, uncertainty analysis, and the use of models in surface water hydrology. A range of common models are applied to study hydrologic topics such as flood forecasting and land use change impacts. Previous experience with Matlab or other programming language is needed.

**ENSCI 518: Stream Ecology**

(Dual-listed with ENSCI 418). (Cross-listed with A ECL). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: A ECL 486*

Biological, chemical, physical, and geological processes that determine the structure and function of flowing water ecosystems. Current ecological theories as well as applications to stream management for water quality and fisheries.

**ENSCI 519: Aqueous and Environmental Geochemistry**

(Dual-listed with ENSCI 419). (Cross-listed with GEOL). (2-2) Cr. 3. S.

*Prereq: CHEM 178; CHEM 178L; Junior classification*

Geochemistry of natural waters and water-rock interactions. Acid-base equilibria, carbonate chemistry and buffer systems, mineral dissolution and precipitation, sorption, ion exchange, and redox reactions. Introduction to thermodynamics and kinetics. Laboratory emphasizes chemical analysis of waters and computer modeling.

**ENSCI 520: Environmental Engineering Chemistry**

(Dual-listed with ENSCI 420). (Cross-listed with C E). (2-3) Cr. 3. F.

*Prereq: C E 326; CHEM 178*

Principles of chemical and physical phenomena applicable to the treatment of water and wastewater and natural waters; including chemical equilibria, reaction kinetics, acid-base equilibria, chemical precipitation, redox reactions, and mass transfer principles. Individual laboratory practicals and group projects required.

**ENSCI 521: Environmental Biotechnology**

(Cross-listed with C E). (2-2) Cr. 3. F.

*Prereq: C E 326*

Fundamentals of biochemical and microbial processes applied to environmental engineering processes, role of microorganisms in wastewater treatment and bioremediation, bioenergetics and kinetics, metabolism of xenobiotic compounds, waterborne pathogens and parasites, and disinfection. Term paper and oral presentation.

**ENSCI 522: Water Pollution Control Processes**

(Cross-listed with C E). (2-2) Cr. 3.

*Prereq: C E 421 or C E 521*

Fundamentals of biochemical processes, aerobic growth in a single CSTR, multiple events in complex systems, and techniques for evaluating kinetic parameters; unit processes of activated sludge system, attached growth systems, stabilization and aerated lagoon systems, biosolids digestion and disposal, nutrient removal, and anaerobic treatment systems.

**ENSCI 523: Physical-Chemical Treatment Process**

(Cross-listed with C E). (2-2) Cr. 3.

*Prereq: C E 520*

Mass balances. Principles and design of physical-chemical unit processes including ideal and realistic reactors; heterogeneous process including gas transfer, sorption, precipitation, and dissolution; redox; flocculation/coagulation; gravity separations; filtration; and membrane processes, electrodialysis, fouling, and scaling. Emphasis on water and wastewater treatment for environmental, health, and aesthetic ends. Case studies in secondary industries.

**ENSCI 524: Air Pollution**

(Dual-listed with ENSCI 424). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 524A: Air Pollution: Air quality and effects of pollutants**

(Dual-listed with ENSCI 424A). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 524B: Air Pollution: Climate change and causes**

(Dual-listed with ENSCI 424B). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 524C: Air Pollution: Transportation Air Quality**

(Dual-listed with ENSCI 424C). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: For 424C: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524C: C E 524A*

**ENSCI 524D: Air Pollution: Off-gas treatment technology**

(Dual-listed with ENSCI 424D). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: For 424D: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above, For 524D: C E 524A; C E 524B*

**ENSCI 524E: Air Pollution: Agricultural sources of pollution**

(Dual-listed with ENSCI 424E). (Cross-listed with A B E, C E). (1-0) Cr. 1.

*Prereq: (CHEM 178 or [PHYS 231; PHYS 231L]); (MATH 166 or 3 credits in STAT); Senior classification or above*

1 cr. per module. Module A prereq for all modules; module B prereq for D and E.

**ENSCI 526: Stable Isotopes in the Environment**

(Dual-listed with ENSCI 426). (Cross-listed with GEOL). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to the theory, methods and applications of stable isotopes. Primary focus on the origin, natural abundance, and fractionation of carbon, hydrogen, oxygen, nitrogen isotopes. Applications of isotopic occurrence for elucidation of physical, chemical, biological, and environmental processes. Effects of plant physiology, photosynthesis, trophic structure, diffusion, evaporation, chemical precipitation, soil and atmospheric processes, and environmental factors on isotope abundance.

**ENSCI 528: Solid and Hazardous Waste Management**

(Cross-listed with C E). (3-0) Cr. 3.

*Prereq: C E 326 or background courses in both environmental chemistry and microbiology; junior or higher standing*

Evaluation, characterization, assessment, planning and design of solid and hazardous waste management systems, regulatory requirements, material characterization and collection, minimization and recycling, energy and materials recovery, composting, off-gas treatment, incineration, stabilization, and landfill design. Design of treatment and disposal systems, including physical, chemical, and biological treatment, solidification, incineration, secure landfill design, and final disposal site closure plus restoration.

**ENSCI 531: Design and Evaluation of Soil and Water Conservation Systems**

(Cross-listed with A B E). (2-3) Cr. 3. F.

*Prereq: A B E 378 or C H E 356*

Hydrology and hydraulics in agricultural and urbanizing watersheds. Design and evaluation of systems for the conservation and quality preservation of soil and water resources. Use and analysis of hydrologic data in engineering design; relationship of topography, soils, crops, climate, and cultural practices in conservation and quality preservation of soil and water for agriculture. Small watershed hydrology, water movement and utilization in the soil-plant-atmosphere system, agricultural water management, best management practices, and agricultural water quality.

**ENSCI 532: Nonpoint Source Pollution and Control**

(Cross-listed with A B E). (3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: A B E 431 or C E 372*

Characteristics and mechanisms of non-point source (NPS) pollution in agricultural and urban watersheds, modeling of NPS pollution for terrestrial and aquatic systems, statistical tools to assess environmental datasets, strategies to control and manage NPS pollution of water bodies, and integrated watershed management. Graduate students are required to develop/deliver lecture models on assigned topics and/or complete additional assignments.

**ENSCI 533: Erosion and Sediment Transport**

(Cross-listed with A B E, NREM). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372 or GEOL/ENSCI/MTEOR 402, MATH 166 or equivalent*

Soil erosion processes, soil loss equations and their application to conservation planning, sediment properties, initiation of sediment motion and over land flow, flow in alluvial channels and theory of sediment transport, channel stability, reservoir sedimentation, wind erosion, BMPs for controlling erosion.

**ENSCI 535: Restoration Ecology**

(Cross-listed with EEOB, NREM). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 366 or BIOL 474 or graduate standing*

Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

**ENSCI 537: Watershed Modeling and Policy**

(Cross-listed with A B E). (2-2) Cr. 3. Alt. F., offered irregularly.

*Prereq: C E 372*

A project-based course on watershed-scale models for improving water quality. Legislative and judicial basis of the Total Maximum Daily Load (TMDL) program; approaches to TMDL development; principles and techniques for implementation; stakeholder engagement strategies. Hands-on experiences with GIS-interfaced models, data sources, calibration/validation, statistical assessment of model results, and simulation using multiple tools. In addition to other assignments, graduate students will present case studies of TMDLs using different modeling tools.

**ENSCI 546: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with ENSCI 446). (Cross-listed with NREM). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**ENSCI 552: Intro GIS for Geoscientists**

(Dual-listed with ENSCI 452). (Cross-listed with AGRON, GEOL). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**ENSCI 553: Soil-Plant Relationships**

(Cross-listed with AGRON). (3-0) Cr. 3. S.

Composition and properties of soils in relation to the nutrition and growth of plants.



**ENSCI 559: Environmental Soil and Water Chemistry**

(Dual-listed with ENSCI 459). (Cross-listed with AGRON). (3-3) Cr. 4. F.

*Prereq:* 6 credit of CHEM; (AGRON 182 or AGRON 360); MATH 140

An introduction to the chemical properties of soils, chemical reactions and transformations in soils and surface waters, and their impact on the environment. Topics include solution chemistry in soils and surface waters, solid-phase composition of soils, reactions at the solid-solution interface, and applications to contemporary environmental issues.

AGRON 354; GEOL 100 recommended.

**ENSCI 563: Soil Formation and Landscape Relationships**

(Dual-listed with ENSCI 463). (Cross-listed with AGRON). (3-0) Cr. 3. F.

Relationships between soil formation, geomorphology, and environment. Soil description, classification, geography, mapping, and interpretation for land use. Two weekend field trips. AGRON 182 or ENSCI 250 recommended. Credit for one of AGRON 463 or AGRON 463I may be applied for graduation.

**ENSCI 564: Wetland Ecology**

(Dual-listed with ENSCI 464). (Cross-listed with EEOB). (3-0) Cr. 3. S.

*Prereq:* 15 credits in biological sciences.

Ecology, classification, creation and restoration, and management of wetlands. Emphasis on North American temperate wetlands.

**ENSCI 566: Ecosystem Services**

(Dual-listed with ENSCI 466). (Cross-listed with NREM). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**ENSCI 568: Applied Geostatistics for Geoscientists**

(Dual-listed with ENSCI 468). (Cross-listed with GEOL, MTEOR). Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

**ENSCI 571: Surface Water Hydrology**

(Cross-listed with C E). (3-0) Cr. 3. S.

*Prereq:* C E 372

Analysis of hydrologic data including precipitation, infiltration, evapotranspiration, direct runoff and streamflow; theory and use of frequency analysis; theory of streamflow and reservoir routing; use of deterministic and statistical hydrologic models. Fundamentals of surface water quality modeling, point and non-point sources of contamination.

**ENSCI 572: Analysis and Modeling Aquatic Environments**

(Cross-listed with C E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* C E 372

Principles of surface water flows and mixing. Introduction to hydrologic transport and water quality simulation in natural water systems. Advection, diffusion and dispersion, chemical and biologic kinetics, and water quality dynamics. Applications to temperature, dissolved oxygen, primary productivity, and other water quality problems in rivers, lakes and reservoirs. Deterministic vs. stochastic models.

**ENSCI 573: Groundwater Hydrology**

(3-0) Cr. 3. F.

*Prereq:* C E 372

Principles of groundwater flow, hydraulics of wells, superposition, slug and pumping tests, streamlines and flownets, and regional groundwater flow. Contaminant transport. Computer modeling. Design project. Extra assignments required for graduate students.

**ENSCI 575: Soil Formation and Transformation**

(Cross-listed with AGRON). (1-0) Cr. 1. F.

*Prereq:* AGRON 463 or equivalent

A one-week intensive field class examining the pedology of Iowa under natural and transformed con.

**ENSCI 577: Soil Physics**

(Dual-listed with ENSCI 477). (Cross-listed with AGRON). (3-0) Cr. 3. S.

The physical soil system: the soil components and their physical interactions; transport processes involving water, air, and heat. AGRON 182 recommended.

**ENSCI 578: Laboratory Methods in Soil Physics**

(Cross-listed with AGRON). (0-3) Cr. 1. S.

*Prereq:* concurrent enrollment in AGRON 477 or AGRON 577

Methods of measuring soil physical properties such as texture, density, and water content, and transport of heat, water, and gases.



**ENSCI 579: Surficial Processes**

(Dual-listed with ENSCI 479). (Cross-listed with GEOL). (2-3) Cr. 3. F.  
The study of physical processes that shape Earth's surface. Topics include weathering, sediment transport, and landform genesis with emphasis on fluvial, glacial, hillslope, eolian, and coastal processes. Applications to engineering and environmental problems. Laboratory includes topographic map interpretation and local field trips.

**ENSCI 583: Environmental Biogeochemistry**

(Dual-listed with ENSCI 483). Cr. 3. Alt. S., offered odd-numbered years.  
*Prereq: 12 credits in BIOL, CHEM, PHYS*

An exploration of biological, physical and geochemical impacts on the structure and function of ecosystems from local to global scales. Emphasis on the cycles of carbon, nitrogen, phosphorus, sulfur, and metals, and how these have been impacted by human activity. Topics may include biological feedbacks to climate change, microbial physiology and redox reactions, plant/soil feedbacks, terrestrial/aquatic linkages, early Earth processes and the origins of life.

**ENSCI 584: Ecosystem Science**

(Cross-listed with EEOB). (3-0) Cr. 3. Alt. S., offered even-numbered years.  
*Prereq: Combined 12 credits in biology, chemistry, and physics.*

Advanced studies of ecosystems and the biological and physical factors that influence their properties and dynamics. Conceptual foundations and modern approaches to ecosystem studies. Interactions among organisms, biological diversity, and ecosystem attributes. Quantitative analyses of accumulations, transformations, and fluxes of nutrients, water, and energy within and among ecosystems. Global change issues.

**ENSCI 585: Soil and Environmental Microbiology**

(Dual-listed with ENSCI 485). (Cross-listed with AGRON, MICRO). (2-3) Cr. 3. F.  
*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**ENSCI 586: Aquatic Ecology**

(Dual-listed with ENSCI 486). (Cross-listed with A ECL, EEOB). (3-0) Cr. 3. F.  
*Prereq: BIOL 312 or ENSCI 319 or ENSCI 402 or NREM 301*

Structure and function of aquatic ecosystems with application to fishery and pollution problems. Emphasis on lacustrine, riverine, and wetland ecology.

**ENSCI 586L: Aquatic Ecology Laboratory**

(Dual-listed with ENSCI 486L). (Cross-listed with A ECL, EEOB). (0-3) Cr. 1. F.

*Prereq: Concurrent enrollment in BIOL 486*

Field trips and laboratory exercises to accompany 486. Hands-on experience with aquatic research and monitoring techniques and concepts.

**ENSCI 587: Microbial Ecology**

(Dual-listed with ENSCI 487). (Cross-listed with EEOB, GEOL, MICRO). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**ENSCI 588: Raster GIS for Geoscientists**

(Dual-listed with ENSCI 488). (Cross-listed with AGRON, GEOL). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**ENSCI 589: Survey of Remote Sensing Technologies**

(Dual-listed with ENSCI 489). (Cross-listed with E E, GEOL, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**ENSCI 590: Special Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of major professor in Environmental Science faculty*

Literature reviews and conference in accordance with needs and interest of the student.

**ENSCI 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of major professor in Environmental Science faculty*

Creative component for nonthesis master of science degree.

**Courses for graduate students:****ENSCI 698: Seminar in Environmental Science**

Cr. 1-3. Repeatable. S.

Reports and discussion of recent research and literature.

**ENSCI 699: Research**

Cr. arr. Repeatable. F.S.SS.

## Environmental Studies (ENV S)

*Any experimental courses offered by ENV S can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**ENV S 101: Environmental Geology: Earth in Crisis**

(Cross-listed with GEOL). (3-0) Cr. 3. F.S.SS.

Exploration of the interactions between humans and the geologic environment, and the consequences of those interactions, on local to global scales. Discussion of water, soil, mineral, and energy resources, pollution, climate change, and natural hazards such as earthquakes, volcanism, mass wasting, and flooding.

**ENV S 108: Introduction to Oceanography**

(Cross-listed with GEOL). (3-0) Cr. 3. F.

Introduction to the study of oceans and the processes that helped shape them. A major focus is on how the oceans work, with special attention on geological, chemical, and biological processes. Ocean circulation and its influence on climate. Life of the oceans. Use and misuse of ocean resources. Anthropogenic impacts on the oceanic environment.

**ENV S 111: Geological Disasters**

(Cross-listed with GEOL). (1-0) Cr. 1. F.S.SS.

Introduction to the catastrophic geologic processes with the potential to devastate human populations that continue to expand into regions at greatest risk from geologic hazards. Selected case studies and discussion of plate tectonics, climate, and earth processes explain the driving forces behind natural hazards such as earthquakes, tsunamis, volcanic eruptions, landslides, and floods.

**ENV S 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, NREM). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**ENV S 130: Natural Resources and Agriculture**

(Cross-listed with NREM). (3-0) Cr. 3. S.

Survey of the ecology and management of fish, forest, and wildlife resources in areas of intensive agriculture, with emphasis on Iowa. Conservation and management practices for private agricultural lands. Designed for nonmajors.

**ENV S 140: Climate and Society**

(Cross-listed with AGRON, GEOL, MTEOR). Cr. 3. F.S.

The climate system of our planet. How nature and our actions alter the existing energy balance leading to climate change. Past climates on our planet. The influence of climate on society and resource availability during the Holocene (~ 11,000 years ago to present) with focus on changes post industrial revolution. Significant climate events that have altered our way of life in the past. Projected changes in future climate and potential impacts on society, environment and resources. Adaption to and mitigation of climate change.

Meets International Perspectives Requirement.

**ENV S 160: Water Resources of the World**

(Cross-listed with AGRON, GEOL, MTEOR). (3-0) Cr. 3. S.

Study of the occurrence, history, development, and management of world water resources. Basic hydrologic principles including climate, surface water, groundwater, and water quality. Historical and current perspectives on water policy, use, and the role of water in society and the environment. Meets International Perspectives Requirement.

**ENV S 173: Environmental Biology**

(Cross-listed with BIOL). (3-0) Cr. 3. F.S.

An introduction to the structure and function of natural systems at scales from the individual to the biosphere and the complex interactions between humans and their environment. Discussions of human population growth, biodiversity, sustainability, resource use, and pollution. Does not satisfy biology major requirements.

**ENV S 201: Introduction to Environmental Issues**

(Cross-listed with BIOL, ENSCI). (2-0) Cr. 2. F.

Discussion of current and emerging environmental issues such as human population growth, energy use, loss of biodiversity, water resources, and climate change.

**ENV S 204: Biodiversity**

(Cross-listed with BIOL). (4-0) Cr. 2. S.

*Prereq: One course in life sciences*

Survey of the major groups of organisms and biological systems. Definition, measurements, and patterns of distribution of organisms. Sources of information about biodiversity. Does not satisfy biology major requirements. Half semester course. See list of life science courses (<https://www.cals.iastate.edu/student-services/lifescience>) for additional information.

**ENV S 220: Globalization and Sustainability**

(Cross-listed with ANTHR, GLOBE, M E, MAT E, SOC). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**ENV S 250: Environmental Geography**

(Cross-listed with AGRON, ENSCI, NREM). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

**ENV S 270: Foundations in Natural Resource Policy and History**

(Cross-listed with L A, NREM). (3-0) Cr. 3. F.

The development of natural resource conservation philosophy and policy from the Colonial Era to the present. North American wildlife, forestry, and environmental policy; national parks and other protected lands; federal and state agencies. Relationship to cultural contexts, including urban reform and American planning movement. Discussion of common pool resources, public and private lands.

**ENV S 283: Introduction to Environmental Politics and Policies**

(Cross-listed with POL S). (3-0) Cr. 3. S.

Introduction to how major ideologies address conservation and ecology. Processes, participants, and institutions involved in state, national, and global environmental policymaking. Case studies of environmental controversies and proposals for policy reform.

**ENV S 293: Environmental Planning**

(Cross-listed with C R P). (3-0) Cr. 3. F.S.

Comprehensive overview of the field of environmental relationships and the efforts being made to organize, control, and coordinate environmental, aesthetic, and cultural characteristics of land, air, and water.

**ENV S 319: Analysis of Environmental Systems**

(Cross-listed with BIOL, ENSCI). Cr. 3. S.

*Prereq: ENSCI 312; Junior classification*

Systems approach to the analysis and modeling of material and energy flows in natural and managed environmental systems and the primary environmental factors controlling these systems. Applications in hydrology, biogeochemistry, and population dynamics.

**ENV S 320: Ecofeminism**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Women's relationships with the earth, non-human nature, and other humans. The course explores the connections between society's treatment of women and nature; origins of ecofeminism and how it relates to the science of ecology, conventional and sustainable agriculture as well as how ecofeminism relates to other branches of feminist philosophy. Evaluation and critique of modern science, technology, political systems and SOLUTIONS will be included.

**ENV S 324: Energy and the Environment**

(Cross-listed with ENSCI, GEOL, MTEOR). (3-0) Cr. 3. S.

*Prereq: CHEM 163 or CHEM 167 or CHEM 177*

Exploration of the origin of Earth's energy resources and the environmental and climatic impacts of energy acquisition and consumption. Renewable and non-renewable energy resources within an Earth-system context. Various environmentally-relevant topics such as water quality and availability, habitat destruction, greenhouse-gas emissions, and health and safety hazards to wildlife and human communities.

**ENV S 334: Environmental Ethics**

(Cross-listed with PHIL). (3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Thorough study of some of the central moral issues arising in connection with human impact on the environment, e.g., human overpopulation, species extinction, forest and wilderness management, pollution. Several world views of the proper relationship between human beings and nature will be explored.

**ENV S 342: World Food Issues: Past and Present**

(Cross-listed with AGRON, FS HN). (3-0) Cr. 3. F.S.SS.

*Prereq: Junior classification*

Issues associated with global agricultural and food systems including ethical, social, economic, environmental, and policy contexts. Investigation of various causes and consequences of overnutrition/undernutrition, global health, poverty, hunger, access, and distribution. Meets International Perspectives Requirement.

**ENV S 345: Population and Society**

(Cross-listed with SOC). (3-0) Cr. 3. F.

*Prereq: SOC 134*

Human population growth and structure; impact on food, environment, and resources; gender issues; trends of births, deaths, and migration; projecting future population; population policies and laws; comparison of the United States with other societies throughout the world. Meets International Perspectives Requirement.

**ENV S 355: Literature and the Environment**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of texts that address a wide range of environmental issues, including the relationship between humans and natural/urban environments, views of other-than-human beings, food, climate change, extinction, and social and racial justice. Assignments for the course may include research, exams, writing, and/or individual/group projects.

**ENV S 362: Global Environmental History**

(Cross-listed with HIST). (3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Survey of the interactions of human communities with their environments from the beginnings of human history to the present. Topics include the domestication of animals, the agricultural revolution, industrialization, urbanization, deforestation, hydraulic management, fossil fuel consumption, and climate change.

**ENV S 363: U. S. Environmental History**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of the interactions of human communities with the North American environment. Focus on the period from presettlement to the present, with a particular concentration on natural resources, disease, settlement patterns, land use, and conservation policies.

**ENV S 380: Energy, Environmental and Resource Economics**

(Cross-listed with ECON). (3-0) Cr. 3.

*Prereq: ECON 101*

Natural resource availability, use, conservation, and government policy, with emphasis on energy issues. Environmental quality and pollution control policies.

**ENV S 382: Environmental Sociology**

(Cross-listed with SOC). (3-0) Cr. 3. F.S.

*Prereq: 3 credits of ENV S or SOC 134*

Environment-society relations; social construction of nature and the environment; social and environmental impacts of resource extraction, production, and consumption; environmental inequality; environmental mobilization and movements; U.S. and international examples. Meets International Perspectives Requirement.

**ENV S 390: Internship in Environmental Studies**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Environmental Studies Coordinator*

Practical experience with nature centers, government agencies, schools, private conservation groups, and other organizations. Offered on a satisfactory-fail basis only.

**ENV S 404: Global Change**

(Cross-listed with AGRON, ENSCI, MTEOR). (3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**ENV S 407: Watershed Management**

(Cross-listed with ENSCI, NREM). (3-3) Cr. 4. S.

*Prereq: 1 course in BIOL*

Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

**ENV S 424: Sustainable and Environmental Horticulture Systems**

(Cross-listed with HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Inquiry into ethical issues and environmental consequences of horticultural cropping systems, production practices and managed landscapes. Emphasis on systems that are resource efficient, environmentally sound, socially acceptable, and profitable.

**ENV S 450: Issues in Sustainable Agriculture**

(Cross-listed with AGRON). (3-0) Cr. 3. S.

Agricultural science as a human activity; contemporary agricultural issues from agroecological perspective. Comparative analysis of intended and actual consequences of development of industrial agricultural practices.

**ENV S 460: Controversies in Natural Resource Management**

(Cross-listed with NREM). (3-0) Cr. 3. F.S.

*Prereq: (A ECL 312 or NREM 301); NREM 120; Junior classification*

Analysis of controversial natural resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding. Ecological, social, political, economic, and ethical implications of issues will be analyzed.

**ENV S 484: Sustainable Communities**

(Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: Junior classification*

The history and theory of sustainable community planning. Procedural and substantive dimensions. Case studies of communities engaged in sustainability planning. Use and development of indicators.

**ENV S 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Instructor; Permission of Environmental Studies Coordinator*

### ENV S 490H: Independent Study: Honors

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Instructor; Permission of Environmental Studies Coordinator*

### ENV S 491: Environmental Law and Planning

(Cross-listed with C R P, L A). (3-0) Cr. 3. S.

*Prereq: 6 credits in natural sciences or Permission of Instructor*

Environmental law and policy as applied in planning at the local and state levels. Brownfields, environmental justice, water quality, air quality, wetland and floodplain management, and local government involvement in ecological protection through land use planning and other programs.

### ENV S 496: Travel Course

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings.

### ENV S 496A: International Tour

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings.

### ENV S 496B: Domestic Tour

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Extended field trips to study environmental topics in varied locations. Location and duration of trips will vary. Trip expenses paid by students. Check with department for current offerings.

## Event Management (EVENT)

*Any experimental courses offered by EVENT can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

### EVENT 171: Introduction to Event Management

(3-0) Cr. 3. F.S.

Overview of the event management industries. Techniques and procedures required for designing and implementing successful events.

### EVENT 203: Event Management Sophomore Mentorship

(1-2) Cr. 2.

*Prereq: Sophomore classification; AESHM 111; EVENT 171; by application only*

Event Management sophomore students will be paired with a professional mentor in the event industry. Students will meet in the class and individually with their professional mentor throughout the spring semester. Students will be assessed on their experience through reflection, presentation, and mentor evaluation.

### EVENT 212: Digital Production in Event Management

(2-2) Cr. 3. F.S.

Applications of skills in Adobe Suite and other software technologies. Introduction to design elements used within the event management industry with a focus on digital publishing of marketing and promotional materials, wayfinding, and other stationery items. Face-to-face lecture and laboratory work.

### EVENT 277: Introduction to Digital Promotion in Event Management

(3-0) Cr. 3. S.SS.

*Prereq: EVENT 171 or HSP M 101 or A M D 131*

Event management digital channels and platforms, including display advertising, search advertising, social media, and mobile. Students will be introduced to the most popular event management platforms as well as digital event management topics of visual marketing, digital media planning, and content marketing.

### EVENT 290: Independent Study

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshman or Sophomore Classification. Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. No more than 9 credits of EVENT 290 and EVENT 490 may be applied towards graduation requirements.

### EVENT 328: Incentive Meeting Management

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

Overview of the incentive meeting industry. Focus on incentive meeting planning, destination selection, program development, risk management, cultural aspects of destination, incentive meeting execution, and incentive meeting evaluation.

### EVENT 333: Entertainment Venue Management

(3-0) Cr. 3. F.

*Prereq: EVENT 171; Event Management major or minor*

Organization and management of various types of entertainment venues including clubs, theaters, auditoriums, and arenas.

**EVENT 367: Event Sales**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; (AESHM 340 or MKT 340)*

Overview of sales marketing management in the event industry and highlights of the role of the professional event sales manager in the marketing process. As an event professional, students will identify best sales practices to develop their personal selling style, to build on their strengths, and to create a referral business that delivers results. Principles covered include evaluation of characteristics and skills necessary for success in sales; strategic planning; sales leadership; analyzing customers and markets; designing and developing the sales force; recognize the importance of relationship building; process management; and measurement, analysis, and knowledge management.

**EVENT 371: Conference and Meeting Planning**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Sophomore classification*

Application of event management principles to conference and meeting planning. Providing a comprehensive introduction to the key planning elements of the global conference, convention and meetings.

**EVENT 373: Wedding Planning and Management**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

Overview of wedding event industry. Focus on wedding planning processes and implementation, design, and business planning and development.

**EVENT 378: Sustainable Event Management**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Event Management major/minor only*

Introduction to organizing sustainable events. Discussion of the business case for sustainability in the events industry, as well as practical solutions for reducing environmental and social impacts in accordance with the United Nations Sustainable Development Goals (SDG).

**EVENT 379: Nonprofit Fundraising Event Planning**

(3-0) Cr. 3. F.

*Prereq: EVENT 171; Event Management major or minor*

Foundation of the principles and practice of event fundraising. Opportunity to apply fundraising concepts and techniques by developing a plan for own, or a nonprofit organization.

**EVENT 383: Sports Event Management**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; Event Management major or minor*

A comprehensive overview of sports and recreation competitions, events, and facilities. Best practices in sports event management, sports organizations, and franchises across the industry. In depth look at athlete and guest services, game day operations, marketing, sponsorship, and post-competition.

**EVENT 393: Event Management Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: EVENT Junior or Senior classification; Permission of Instructor*

Topics vary each time offered. Maximum of 6 Event 393 credits can be applied to graduation.

**EVENT 423: International Meetings and Conferences Management**

(3-0) Cr. 3.

*Prereq: EVENT 171; EVENT 371*

A comprehensive understanding of the strategies, procedures and nuances of planning and executing multinational and multicultural meetings, expositions, conventions or events held outside of the United States. The international aspects that will be covered include planning, budgeting, logistics, venue selection, risk management, and cross-cultural understanding.

Meets International Perspectives Requirement.

**EVENT 471: Special Events Coordination**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 171; EVENT 371; Junior classification*

Advanced application of event management - hands-on special event planning experience, an understanding of how events are managed, and confidence in the researching, planning, coordinating, marketing, management, financial management, wayfinding and evaluation of special events.

**EVENT 485: Event Production**

(3-0) Cr. 3. F.S.

*Prereq: EVENT 371; Event Management major*

Event management production and design elements, including experience design, stakeholder relations, risk management, fundraising and sponsorship, promotion, developing objectives, and evaluation and assessment.



**EVENT 486: Advanced Event Production**

(0-6) Cr. 3. Repeatable, maximum of 6 credits. F.

*Prereq: EVENT 371; EVENT 485; Event Management major*

Advanced application event management. Provide leadership and direction for production of an event including vendor and stakeholder relations, budget management, publicity, advertising, choreography, staging, lighting, and food. Maximum of 6 credits may be applied toward graduation. Maximum of 6 credits can be applied toward graduation

**EVENT 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Sections B-D: Program approval; Section H: Full membership in Honors Program*

Independent study.

**EVENT 490B: Independent Study: Conferences**

Cr. arr. Repeatable.

*Prereq: Program approval*

Independent study.

**EVENT 490C: Independent Study: Special Events**

Cr. arr. Repeatable.

*Prereq: Program approval.*

Independent study.

**EVENT 490D: Independent Study: Event Management**

Cr. arr. Repeatable.

*Prereq: Sections B-D: Program approval; Section H: Full membership in Honors Program*

Independent study.

**Courses primarily for graduate students, open to qualified undergraduates:**

**EVENT 531: Event Business Research Essentials**

(3-0) Cr. 3. F.

*Prereq: permission of instructor*

Event leaders must understand how to apply the most appropriate tools and methods to accomplish the event's business objectives. Exploration of the knowledge and skills necessary to address the rapidly growing demand for a systematic approach to event business research and its application to strategic decision making. Examination of case studies, primary and secondary sources of information, as well as research design, measurement, sampling, data collection, processing, analysis, and interpretation.

**EVENT 561: Advanced Topics in Event Management**

(3-0) Cr. 3. S.

*Prereq: permission of instructor*

Advanced meeting and event planning topics including event strategy, event risk and security management, event financial management, event design, event project management, and event tourism strategy.

**EVENT 577: Advanced Social Media Marketing in Event Management**

(3-0) Cr. 3. F.

*Prereq: permission of instructor*

Project-based course that includes analyzing relevant literature in social media and developing, implementing, and assessing an integrated social media marketing strategy in the event planning business marketing plan. Perspective on digital/social/mobile marketing to appreciate its true value to consumers, to managers, and to other corporate stakeholders.

**EVENT 578: Advanced Event Sustainability Management**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: permission of instructor*

Examination of the critical area of sustainability and the reasons why event businesses must prioritize it if they are to succeed. Many people mistakenly believe that sustainability is synonymous with 'green' and is solely concerned with the environment. This is incorrect, as true business sustainability considers both societal and economic factors, as it encompasses both the impact on societal stakeholders (consumers and employees) and the profit required to sustain a business. Examine how contemporary human societies can adapt to global change and build healthier systems.

**EVENT 590: Special Topics**

Cr. 3. F.S.

*Prereq: Graduate level standing; permission of instructor*

Topics in event management.

**EVENT 599: Creative Component**

(3-0) Cr. 3.

*Prereq: Graduate level standing*

Creative component as arranged with instructor.

**Courses for graduate students:**

**EVENT 634: Theory and Research Seminar in Event Management**

(3-0) Cr. 3. SS.

*Prereq: STAT 401 or a graduate level course in statistics or by permission of instructor*

Analysis and application of theories and research methodologies in event management and is designed to strengthen students' analytical and critical perspectives to evaluate event management research. Multidisciplinary approach to the areas of sports events, festivals and fairs, conventions and tradeshow, mega events, and event tourism.

# Family and Consumer Sciences Education and Studies (FCEDS)

**Any experimental courses offered by FCEDS can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## **FCEDS 206: Professional Roles in Family and Consumer Sciences**

(1-1) Cr. 2. F.

Explore the “secret” history of Home Economics and how women pioneered an academic discipline that grew and evolved into a variety of modern disciplines including family & consumer sciences (FCS), human services, human sciences, human ecology, etc. Introduction to various roles in professional settings (community agencies, secondary schools, business and industry, and Cooperative Extension). Includes 12 hours of field experience, scheduled outside of class.

## **FCEDS 301: Current Family and Consumer Sciences Offerings**

Cr. 3. F.S.SS.

*Prereq: 6 credits in FCEDS*

Course in current family and consumer sciences offerings.

## **FCEDS 301F: Housing**

(3-0) Cr. 3. Alt. SS., offered odd-numbered years.

*Prereq: 6 credits in FCEDS*

Concepts in interior design and housing. Fulfills “Housing” content component for Iowa teaching endorsement 139: Family and Consumer Sciences.

## **FCEDS 301K: Textile Selection and Apparel Construction Methods**

(2-1) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: 6 credits in FCEDS*

Concepts in interior design and housing. Fulfills “Housing” content component for Iowa teaching endorsement 139: Family and Consumer Sciences.

## **FCEDS 306: Educational Principles for Family and Consumer Sciences**

(3-2) Cr. 4. F.

*Prereq: FCEDS 206 or Permission of Instructor*

Principles of teaching and learning applied to family and consumer sciences content incorporating literacy and STEM strategies for diverse audiences. Focus on providing a broad overview of effective instructional methods and substantial technological tools to meet varied learning needs. Includes 12 hours of arranged practicum and team teaching.

## **FCEDS 380V: Pre-Student Teaching Experience in FCS Education: Practicum in FCS Labs**

(Cross-listed with EDUC). (0-2) Cr. 1-2. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; Admission to Educator Preparation program*

Laboratory experience in foods, hospitality management, culinary, prostart, textiles, fashion design, housing, and human development related to family and consumer sciences courses taught at the secondary level. Planning, implementing, managing, and assessing laboratory lessons in family and consumer sciences. Includes 24 hours practicum: unsupervised. 1/2 day of time needed in schedule. Offered on a satisfactory-fail basis only.

## **FCEDS 413: Planning and Assessment for Family and Consumer Sciences**

(3-0) Cr. 3. S.

*Prereq: FCEDS 306; Admission to Educator Preparation program*

Development of curriculum and assessment tools for family and consumer sciences programs in school settings. Focus on accommodating exceptional learners and alignment of teaching standards for classroom assessment. Includes 12 hours of Career and Technical Student Organization Competitive Event Assessment at the state/national level.

## **FCEDS 417: Supervised Teaching in Family and Consumer Sciences**

Cr. 3-8. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; FCEDS 380V; FCEDS 380V; FCEDS 413;*

*minimum 24 credits in FCEDS; cumulative grade point of 2.50; admission to Educator Preparation program*

Supervised teaching experience in secondary schools.

## **FCEDS 417A: Supervised Teaching in Family and Consumer Sciences: Vocational family and consumer sciences.**

Cr. 3-8. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; FCEDS 380V; FCEDS 380V; FCEDS 413;*

*minimum 24 credits in FCEDS; cumulative grade point of 2.50; admission to Educator Preparation program*

Supervised teaching experience in secondary schools.

## **FCEDS 417B: Supervised Teaching in Family and Consumer Sciences: Family and consumer sciences.**

Cr. 3-8. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; FCEDS 380V; FCEDS 380V; FCEDS 413;*

*minimum 24 credits in FCEDS; cumulative grade point of 2.50; admission to Educator Preparation program*

Supervised teaching experience in secondary schools.

**FCEDS 418: Foundations of Career and Technical Education in Family and Consumer Sciences**

(3-0) Cr. 3. S.

*Prereq: (Credit or concurrent enrollment in FCEDS 413; admission to Educator Preparation program) or Permission of Instructor*

Investigation into the philosophy of Career and Technical Education (CTE). Historical development of family and consumer sciences. Planning and implementing programs in family and consumer sciences including FCCLA. Impact of selected legislation on family and consumer sciences programs. Techniques for cooperative education, school-to-work, and work-based education programs. Includes educational opportunities off campus for professional development and career advancement. May be used toward Multioccupations Endorsement.

**FCEDS 480V: Pre-Student Teaching Experience in FCS Education: Practicum in Diverse Settings**

(Cross-listed with EDUC). (0-4) Cr. 2. Repeatable. F.S.

*Prereq: FCEDS 206; FCEDS 306; FCEDS 380V; admission to Educator Preparation program*

Laboratory experience in foods, textiles, and human development related to family and consumer sciences exploratory programs. Planning, implementing, managing and assessing laboratory lessons in family and consumer sciences. Includes 48 hours practicum and supervised individual teaching. 1/2 day of time needed in schedule. Offered on a satisfactory-fail basis only.

**FCEDS 490: Independent Study**

Cr. arr. F.S.SS.

*Prereq: Permission of Instructor*

**FCEDS 490C: Independent Study: Curriculum**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**FCEDS 490G: Independent Study: General**

Cr. arr. F.S.SS.

*Prereq: Permission of Instructor*

**FCEDS 490H: Independent Study: Honors**

Cr. arr. F.S.SS.

*Prereq: Permission of Instructor*

**FCEDS 491: Supervised Experiences in a Professional Setting**

Cr. 3-8. Repeatable. F.S.SS.

*Prereq: FCEDS 206; FCEDS 306; HD FS 418B; minimum 24 credits in FCEDS*

Supervised professional experience in an approved setting such as Cooperative Extension, business, community, human service, or government agency. Offered on a satisfactory-fail basis only.

**FCEDS 491A: Supervised Experiences in a Professional Setting: Communications**

Cr. 3-8. Repeatable, maximum of 8 credits. F.S.SS.

*Prereq: FCEDS 206; FCEDS 306; HD FS 418B; minimum 24 credits in FCEDS*

Supervised professional experience in an approved setting such as Cooperative Extension, business, community, human service, or government agency. Offered on a satisfactory-fail basis only.

**FCEDS 491B: Supervised Experiences in a Professional Setting: Professional Studies**

Cr. 3-8. Repeatable, maximum of 8 credits. F.S.SS.

*Prereq: FCEDS 206; FCEDS 306; HD FS 418B; minimum 24 credits in FCEDS*

Supervised professional experience in an approved setting such as Cooperative Extension, business, community, human service, or government agency. Offered on a satisfactory-fail basis only.

## Family Financial Planning (FFP)

***Any experimental courses offered by FFP can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**FFP 520: Financial Theory and Research I**

(3-0) Cr. 3. F.S.SS.

Theories of family functioning, macroeconomic theory related to family resource allocation decisions, the family as an economic unit, and the interaction of the economy and families.

**FFP 525: Financial Theory and Research II**

(3-0) Cr. 3. F.S.SS.

Microeconomic theory as it relates to family resource allocation decisions, theories of household behavior, the lifecycle hypothesis, behavioral economics, behavioral finance, theories of behavioral change, and psychological theories of family well-being. Focus on empirical research investigating household financial decision-making.

**FFP 530: Fundamentals of Family Financial Planning**

(3-0) Cr. 3. F.S.SS.

Introduction to the financial planning process and establishing client-planner relationships. Applied work in cash flow, credit and debt, income tax, insurance, investment, retirement and estate planning. Review of services provided to families, documentation required, ethics in financial planning, and Certified Financial Planner™ licensee responsibilities.

**FFP 535: Financial Counseling**

(3-0) Cr. 3. F.S.SS.

Theory and research regarding the interactive process between the client and the practitioner, including communication techniques, motivation and esteem building, the counseling environment, ethics, and methods of data intake, verification, and analysis. Other topics include legal issues, compensation, uses of technology to identify resources, information management, and current or emerging issues.

**FFP 540: Estate Planning for Families**

(3-0) Cr. 3. F.S.SS.

Fundamentals of the estate planning process, including estate settlement, estate and gift taxes, property ownership and transfer, and powers of appointment. Tools and techniques used in implementing an effective estate plan, ethical considerations used in providing estate planning services, and new and emerging issues in the field. Case studies provide experience in developing estate plans suitable for varied family forms.

**FFP 541: Housing and Real Estate in Family Financial Planning**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. SS., offered even-numbered years.

The role of housing and real estate in the family financial planning process, including taxation, mortgages, financial calculations, legal concerns, and ethical issues related to home ownership and real estate investments. Emphasis on emerging issues in the context of housing and real estate.

**FFP 545: Retirement Planning, Employee Benefits, and the Family**

(3-0) Cr. 3. F.S.SS.

Study of micro and macro considerations for retirement planning. Survey of various types of retirement plans, ethical considerations in providing retirement planning services, assessing and forecasting financial needs in retirement, and integration of retirement plans with government benefits.

**FFP 550: Military Personal Financial Readiness**

(3-0) Cr. 3. F.SS.

Overview of the topics relevant to the financial planning process that address the unique needs of military service members and their families.

**FFP 555: Insurance Planning for Families**

(3-0) Cr. 3. F.S.SS.

In-depth study of risk management concepts, tools, and strategies for individuals and families, including life insurance; property and casualty insurance; liability insurance; accident, disability, health, and long-term care insurance; and government-subsidized programs. Current and emerging issues and ethical considerations relative to risk management. Case studies provide experience in selecting insurance products suitable for individuals and family, study of investment options for clients including common stocks, fixed income securities, convertible securities, and related choices. Relationships between investment options and employee/employer benefit plan choices. Current and emerging issues and ethics are included.

**FFP 565: Personal Income Taxation**

(3-0) Cr. 3. F.S.SS.

In-depth information on income tax practices and procedures including tax regulations, tax return preparation, the tax audit processes, the appeals process, preparation for an administrative or judicial forum, and ethical considerations of taxation. New and emerging issues related to taxation. Family/individual case studies provide practice in applying and analyzing tax information and recommending appropriate tax strategies.

**FFP 570: Professional Practices in Financial Planning**

(3-0) Cr. 3. F.S.SS.

Challenges of managing financial planning practices including, but not limited to: business valuation, personnel, marketing, client services, ethics and technological applications. Relying both on a theoretical as well as an applied approach, students analyze case studies that provide relevant, practical exposure to practice management issues, with a strong emphasis on current research findings.

**FFP 583: Investing for the Family's Future**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Evaluation of investment markets for the household. Analysis of how families choose where to put their savings. Emphasis is on using the family's overall financial and economic goals to help inform investment choices.

**FFP 590: Family Financial Planning Seminar**

(3-0) Cr. 3. Repeatable, maximum of 3 times. S.SS.

Through a seminar format comprised of readings, guest lectures, collaborative case studies, peer interaction, and practical application, students will explore the rapidly growing and changing opportunities of sustainable, responsible, and impact investments.

**FFP 591: Practicum**

Cr. 3-6. F.S.SS.

Supervised experience in family financial planning.

**FFP 595: Financial Planning - Case Studies**

(3-0) Cr. 3. F.S.SS.

*Prereq: FFP 530, FFP 540, FFP 545, FFP 555, FFP 565, FFP 583*

Professional issues in financial planning, including ethical considerations, regulation and certification requirements, communication skills, and professional responsibility. Students are expected to utilize skills obtained in other courses and work experiences in the completion of personal finance case studies, the development of a targeted investment policy, and other related financial planning assignments.

## Finance (FIN)

**Any experimental courses offered by FIN can be found at:**

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**FIN 301: Principles of Finance**

(3-0) Cr. 3. F.S.SS.

*Prereq: ACCT 284, ECON 101, STAT 226*

Introduction to financial management with emphasis on corporate financing and investment decision making, time value of money, asset valuation, capital budgeting decision methods, cash budgeting, and financial markets.

**FIN 310: Corporate Finance**

(3-0) Cr. 3. F.S.SS.

*Prereq: FIN 301 and co-requisite of MATH 151 or MATH 160 or MATH 165*

Theory used in a firm's investment and financing decisions. Analysis of environment in which financial decisions are made; applications of analytical techniques to financial management problems.

**FIN 320: Investments**

(3-0) Cr. 3. F.S.SS.

*Prereq: FIN 301; and co-requisite of MATH 151 or MATH 160 or MATH 165*

Introduction to securities and markets from the viewpoint of the individual investor. Emphasis on mechanics of trading, measurement of return and risk, behavior of security prices, valuation of stocks and bonds, mutual funds, portfolio selection techniques, and performance evaluation.

**FIN 330: Financial Markets and Institutions**

(3-0) Cr. 3. F.S.

*Prereq: FIN 301*

Introduction to the structure and operations of the United States financial system and its markets and institutions. Emphasis on developing an integrated understanding of markets and financial service providers including global linkages.

**FIN 361: Personal Risk Management and Insurance**

(3-0) Cr. 3. F.S.

*Prereq: FIN 301*

Risk concepts and the use of insurance by individuals and families. Emphasis on the insurance mechanism and methods of dealing with income, property, and liability risks.

**FIN 371: Real Estate Principles**

(3-0) Cr. 3. SS.

*Prereq: ECON 101*

Legal, economic, social and financial aspects of real estate, including property rights, contracts, mortgage instruments, tax factors, brokerage, valuation, risk and return analysis, financing techniques, and investments.

**FIN 415: Business Financing Decisions**

(3-0) Cr. 3.

*Prereq: FIN 310*

In depth study of the firm's external financing decision. Emphasis on the development of cash flow statements, projected financing needs and the selection of the appropriate financing instrument. Focus on case studies and application of developed techniques on actual field project.

**FIN 424: Financial Futures and Options**

(3-0) Cr. 3.

*Prereq: FIN 320; (STAT 326 or STAT 341)*

Advanced study of pricing and using derivatives - instruments deriving value from fundamental items such as commodities, currency exchange rates, market indices, equities and bonds. Addresses basic building blocks of derivatives (i.e., forwards, futures, options and swaps) and relevant current topics and issues.

**FIN 425: Security Analysis and Portfolio Management**

(3-0) Cr. 3. F.S.

*Prereq: FIN 320; (STAT 326 or STAT 341)*

Advanced study of security analysis, security selection techniques and portfolio management. Emphasis on the applications of methods learned via the selection and evaluation of a portfolio of actual securities purchased in securities markets in the U.S. or abroad. Tracking and periodic reporting of the portfolio's performance relative to standard benchmarks is also required.

**FIN 427: Fixed Income Securities**

Cr. 3.

*Prereq: FIN 320*

Valuation of fixed income securities, including pricing conventions, term structure of interest rates, default, duration, and hedging of interest rate risk with derivatives. Analysis of bond market sectors, including treasury, agency, corporate, sovereign, municipal, and residential mortgage bonds.

**FIN 428: Advanced Fixed Income Analysis and Portfolio Management**

(Dual-listed with FIN 528). (3-0) Cr. 3.

*Prereq: FIN 427*

Advanced analysis of fixed income markets and securities, including valuation and trading of treasury securities, corporate bonds, mortgage backed securities. Analysis of structured financial securities, including CDO, CMBS, and ABS. Analysis of active and passive investment strategies for managing fixed income portfolios. Students are required to manage a fixed income portfolio for an institutional investor. A top-down approach to portfolio management is assumed, with active bets taken on market direction, duration, yield curve, and credit spreads.

**FIN 431: Small Business Finance Decisions**

(Cross-listed with ENTSP). Cr. 3. S.

*Prereq: FIN 310 or ENTSP 313 AND FIN 301*

Integrative nature of small business financial decisions, from basic historical financial analysis to financial projections and valuation unique to small business. Utilize planning/valuation to reconcile the optimal exit date for the small business owner. Examination of this integrative approach through case study. Emphasis on practical application with a decision orientation. Group project working with a small business owner and related advisors/bankers to develop a plan that focuses on an optimal exit strategy.

**FIN 435: Venture Capital, Private Equity, and Mergers and Acquisitions**

(3-0) Cr. 3. S.

*Prereq: FIN 310; FIN 320; (STAT 326 or STAT 341)*

An advanced investments class that focuses on alternative investments. Topics include techniques for valuing public and private firms, venture capital finance, investment banking, private equity finance, leveraged buyouts, hedge funds, the structure and financing of mergers and acquisitions, and divestitures.

**FIN 445: Bank Management Decisions**

(3-0) Cr. 3. F.S.

*Prereq: FIN 310 or FIN 320 or FIN 330 or ECON 353*

Analysis of operations of depository financial institutions from management viewpoint. Emphasis on evaluating performance, policy formation, asset and liability management, the role of capital, and the operating environment.

**FIN 450: Analytical Methods in Finance**

Cr. 3. F.S.

*Prereq: (ECON 301 or FIN 301); (STAT 326 or STAT 341)*

Applied empirical methods commonly employed in the analysis of firm and market data. Specific applications to financial and agricultural markets. Experiential learning experience using lectures with frequent in-class computer work sessions. Experience with financial and agricultural data sources. Application and interpretation of empirical techniques.

**FIN 455: Risk Modeling**

(3-0) Cr. 3. F.S.

*Prereq: FIN 301 or MATH 240, and STAT 326 or STAT 341*

Introduction to predictive modeling and business analytics in the finance and insurance industry. Basic statistical/computing skills, analytical thinking, and business acumen. Develop practical data analytic skills based on building real analytic applications on real data.

**FIN 456: Financial Modeling**

(3-0) Cr. 3.

*Prereq: ACCT 285; FIN 301; (STAT 326 or STAT 341)*

Applying computers to business applications especially using Excel in finance related work.

**FIN 462: Corporate Risk Management and Insurance**

(3-0) Cr. 3. F.

*Prereq: FIN 310*

Analysis of an organization's approaches to the management of price, credit, and pure risk. Emphasis on the consideration and selection of risk control and financing treatments and the decision making framework underlying the alternatives selected. Covers commercial insurance, self-insurance, and alternative financing arrangements.

**FIN 472: Real Estate Finance**

(3-0) Cr. 3.

*Prereq: FIN 301; (STAT 326 or STAT 341)*

Introduction to the techniques of assessing the value of real estate and real estate financing instruments.

**FIN 474: Real Estate Investment**

(3-0) Cr. 3. F.S.

*Prereq: (FIN 371 or FIN 427 or FIN 472); (STAT 326 or STAT 341)*

Introduction to theories and methods of investment analysis applied to real estate. Studies cash flow analysis, alternative measures of investment performance, the impact of the financing decision on real estate investment risks and return, and various real estate financing techniques. Covers cases involving more complex financing and capital markets tools used in real estate.

**FIN 480: International Finance**

(3-0) Cr. 3. F.S.

*Prereq: FIN 310, FIN 320 or FIN 330*

Advanced study of currency market equilibrium, use and analysis of currency derivatives, hedging currency risk, and additional topics, which could include multinational capital budgeting, taxation, raising capital internationally, international portfolio diversification, international capital market equilibrium, political and country risk, financing international trade, multinational corporate treasury management, and current issues.



**FIN 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: FIN 301, STAT 326 and permission of instructor***FIN 491: International Study Course in Global Capital Markets**

Cr. 3. S.

*Prereq: FIN 301*

European capital markets and multinational corporate finance with focus on banking, capital markets, and corporate finance in a particular European country. Exposure to European capital markets, the European Monetary Union and the banking system. Current and historical banking practices within the EU and how they changed since the EMU implementation. Understand financial decisions faced by firms located in the EU. Study banks, institutions, and companies in Europe to gain specific knowledge of their practices. Learn about the culture and general economy of Europe during the in country visit.

**Courses primarily for graduate students, open to qualified undergraduates:**

**FIN 501: Financial Valuation and Corporate Financial Decisions**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or departmental permission.*

Shareholder wealth maximization as the goal of the firm within a social responsibility context, financial Math, valuation of securities, the global financial market place as the test of value, estimation of cost of capital, global capital investment decisions, capital structure policy, working capital management.

**FIN 510: Advanced Corporate Finance**

(3-0) Cr. 3.

*Prereq: FIN 501 or instructor permission*

Examines corporate financial decisions, including theory and associated empirical evidence. Topics include agency conflicts, corporate governance, executive compensation, becoming publicly traded, raising capital through public and private offerings, capital structure, financial distress and bankruptcy, leasing, dividend policy, corporate control, restructuring, and risk management.

**FIN 515: Case Studies in Financial Decision Making**

(3-0) Cr. 3.

*Prereq: FIN 501 or instructor permission*

This course focuses on case studies to develop an integrated set of financial decisions. Topic areas include fixed asset, working capital, capital structure, dividend and merger/acquisition decisions. The objective of the course is to examine different firm settings and establish a framework within which to apply financial tools.

**FIN 520: Investments**

(3-0) Cr. 3.

*Prereq: FIN 501 or instructor permission*

Analysis of risk and return for individual securities and portfolios of securities. Topics include the market environment, mechanics of trading, measurement of return and risk, valuation of stocks and bonds, mutual funds, optimal asset allocation, market efficiency, portfolio performance evaluation, and risk management.

**FIN 528: Advanced Fixed Income Analysis and Portfolio Management**

(Dual-listed with FIN 428). (3-0) Cr. 3.

*Prereq: FIN 427*

Advanced analysis of fixed income markets and securities, including valuation and trading of treasury securities, corporate bonds, mortgage backed securities. Analysis of structured financial securities, including CDO, CMBS, and ABS. Analysis of active and passive investment strategies for managing fixed income portfolios. Students are required to manage a fixed income portfolio for an institutional investor. A top-down approach to portfolio management is assumed, with active bets taken on market direction, duration, yield curve, and credit spreads.

**FIN 530: Financial Analysis and Valuation**

(3-0) Cr. 3.

*Prereq: FIN 501 or instructor permission*

Valuation of public and private firms through analysis of financial statements and other information. Study of drivers of value creation, industry analysis, patterns of growth, models for forecasting and analyzing firm cash flows, estimating and adjusting cost of capital, alternative methods of cash flow valuation, the calculation and use of valuation multiples, and valuing mergers and acquisitions.

**FIN 534: Financial Derivatives**

(3-0) Cr. 3. F.

*Prereq: FIN 501 or Graduate classification*

An applied course in derivative markets. Topics covered include futures and options markets, option pricing, swaps, use and rating of insurance products, and alternative forms of reinsurance. Emphasis will be placed on agricultural commodity markets, but energy, interest, currency and stock index contracts will also be covered.

**FIN 535: Venture Capital, Private Equity, and Mergers and Acquisitions**

(3-0) Cr. 3.

*Prereq: FIN 501 or instructor permission*

Advanced investments class focusing on alternative investments. Topics include the nature and scope of investment banking, techniques for valuing public and private firms, venture capital finance, private equity finance, leveraged buyouts, hedge funds, the structure and financing of mergers and acquisitions, and divestitures.

**FIN 541: Analytics in Finance**

(Cross-listed with MIS). Cr. 3. S.

*Prereq: BUSAD 502 or an advanced undergraduate statistics course recommended*

Introduction to Business Analytics (BA) in finance and the insurance industry. The concepts and tools discussed in this course, to be followed and complemented by more advanced courses in the area. Basic analytical thinking and business acumen focusing on applications from finance and insurance. Practical data analytic skills based on building real analytic applications on real data.

**FIN 550: Financial Econometrics**

(3-0) Cr. 3.

*Prereq: FIN 501*

Analysis, modeling, and forecasting of time series data, volatility modeling and forecasting, maximum likelihood estimation, robust standard error computation, specification testing, estimation under alternative distributional assumptions, and Monte Carlo simulation. Applications include tests of asset pricing models, analysis of asset volatility, corporate event studies, and value at risk analysis.

**FIN 556: Advanced Financial Modeling**

(3-0) Cr. 3. S.

*Prereq: FIN 501*

Applying computers to business applications, especially using Excel to solve advanced finance related problems.

**FIN 564: Advanced Derivatives and Risk Management**

(3-0) Cr. 3.

*Prereq: FIN 501, FIN 534*

Risk management tools and how they are applied within financial institutions and the corporate enterprise. Focus on measuring exposure to stock market risk, interest rate risk, currency risk, and credit risk and how these exposures may be managed. Topics include bank risk management regulations, volatility modeling, value at risk analysis, extreme value theory, credit default swaps, and portfolio simulation.

**FIN 572: Real Estate Finance**

(3-0) Cr. 3.

*Prereq: Graduate Classification*

Survey of techniques for assessing the value of real estate assets. Introduction to real estate financing instruments, their use and appropriateness.

**FIN 574: Real Estate Investment**

(3-0) Cr. 3.

*Prereq: FIN 501 or FIN 572*

Introduction to theories and methods of investment analysis applied to real estate. Designed as second course in the sequence of real estate finance and investments. Basics of income-producing properties, the valuations of those properties using pro-forma, risk management and various other issues about the finance and investment of income-producing properties. Study of analysis of sustainable real estate development from capital budgeting perspective. Discussion of the financing practices in real estate and land development.

**FIN 575: Real Estate Securitization and Portfolio Management**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Mechanics, incentives and importance of securitization in firms' efforts to raise capital with application to residential and commercial real estate. Design and implementation of portfolio management strategies of private-market real estate investments. Additional topics include devising alpha strategies, approaches to diversification, creating investment plans to achieve different risk profiles and performance measurement and analysis.

**FIN 576: Real Estate Market Analysis**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Introduction to the structure of real estate markets. Topics include determinants of supply and demand in space and capital markets, house price dynamics and causes and consequences of market cycles. Discussion of likely behavior of U.S. real estate markets and comparisons with markets in other countries.

**FIN 578: MRED Capstone Project**

(Cross-listed with C R P). (3-0) Cr. 3.

*Prereq: Enrollment in MRED.*

Refinement of students' problem-solving, communication and negotiation skills. Students work on an actual case. Teams will apply knowledge acquired in the classroom to some aspect of a current development on-the-ground and in-process project.

**FIN 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

For students wishing to do individual research in a particular area of finance.

# Food Science and Human Nutrition (FS HN)

**Any experimental courses offered by FS HN can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## **FS HN 101: Food and the Consumer**

(3-0) Cr. 3. F.S.SS.

The food system from point of harvest to the consumption of the food by the consumer. Properties of food constituents. Protection of food against deterioration and microbial contamination. Introduction of foods into the marketplace. Processes for making various foods. Government regulations. Use of food additives. Current and controversial topics. High school biology and chemistry or 3 credits of college level biology and chemistry recommended.

## **FS HN 102: Nutrition for Sport Performance**

(1-0) Cr. 1. F.S.

A scientific evaluation of dietary needs, dietary supplementation, and pop-culture claims relative to physical/sport performance. Discussion of safe and effective practices to enhance physical/sport performance.

## **FS HN 104: Introduction to Professional Skills in Culinary Science**

(0-6) Cr. 1. S.

*Prereq: Major or minor in CUFS A or CUFS H*

Introduction to culinary science. Students will develop fundamental culinary skills by arranged on-campus work experience (100 hours). Sessions with instructor arranged.

## **FS HN 110: Professional and Educational Preparation**

(1-0) Cr. 1. F.S.

Introduction to professional and educational development within the food science and human nutrition disciplines. Focus is on university and career acclimation as well as enhancement of communication skills. Offered on a satisfactory-fail basis only.

## **FS HN 111: Fundamentals of Food Preparation**

(2-0) Cr. 2. S.

*Prereq: (FS HN 101 or FS HN 167); concurrent enrollment in FS HN 115*

Principles involved in preparation of food products of standard quality. Influence of composition and techniques on properties of food products.

## **FS HN 115: Food Preparation Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 111 or FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety.

## **FS HN 120: The Biochemistry of Beer**

(Cross-listed with BBMB). (2-0) Cr. 2. F.

An introduction to the major classes of biomolecules, basic biochemical concepts, enzymology, metabolism and genetic engineering as they apply to the production and flavor of beer. All aspects of the biochemistry of beer will be covered, including the malting of barley, starch conversion, yeast fermentation and the chemical changes that occur during the aging of beer. Intended for non-majors. Natural science majors are limited to elective credit only.

## **FS HN 120L: Biochemistry of Beer Laboratory**

(Cross-listed with BBMB). Cr. 1.

*Prereq: Credit or concurrent enrollment in BBMB 120*

An introduction to biochemical methods related to the production of beer. Laboratory exercises related to water chemistry, mash enzymology, hop compound extraction and analysis, and yeast biology will be performed. Closely follows the material being taught in BBMB 120. Natural science majors are limited to elective credit only.

## **FS HN 167: Introductory Human Nutrition and Health**

(3-0) Cr. 3. F.S.SS.

Understanding and implementing present day knowledge of nutrition. The role of nutrition in the health and well being of the individual and family. High school biology or 3 credits of biology recommended.

## **FS HN 203: Contemporary Issues in Food Science and Human Nutrition**

(1-0) Cr. 1. F.S.

Introduction to presentation of published research and discussion of current issues in food science and human nutrition. Emphasis on sources of credible information, ethics, and communication.

## **FS HN 207: Processing of Foods: Basic Principles and Applications**

(2-3) Cr. 3. S.

*Prereq: FS HN 101*

Lecture and lab-based instruction on principles of food processing and packaging. Food product-based discussion and activities will highlight raw food materials; unit operations; food quality and safety; processing plant sanitation; food forming and extrusion; fermentation; properties and selection of packaging materials.

## **FS HN 214: Scientific Study of Food**

(3-0) Cr. 3. F.S.

*Prereq: (FS HN 167 or FS HN 265); (CHEM 231 or CHEM 331); concurrent enrollment in FS HN 115 or FS HN 215*

Composition and structure of foods. Principles of preparation of standard quality food products. Behavior and interactions of food constituents.

**FS HN 215: Advanced Food Preparation Laboratory**

(0-6) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in FS HN 214*

Practice standard methods of food preparation with emphasis on quality, nutrient retention, and safety. Development of culinary skills and advanced food preparation.

**FS HN 220: American Food and Culture**

(3-0) Cr. 3. F.S.

American cuisine reflects the history of the U.S. It is the unique blend of diverse groups of people from around the world, including indigenous Native American Indians, Africans, Asians, Europeans, Pacific Islanders, and South Americans. Explore factors that impact the American Cuisine of today including diverse ethnic and cultural group influences, historical events related to food diversity in the U.S., and agriculture and industrial impacts on food production. Practical knowledge and basic food preparation techniques related to the U.S. food system and trends. Class sessions will include lectures, class discussions and Tasting Immersion activities.

**FS HN 241: Introduction to Manufacturing Processes for Plastics**

(Cross-listed with TSM). (1-2) Cr. 2. F.S.

*Prereq: MATH 145*

A study of selected materials and related processes used in plastics manufacturing. Lecture and laboratory activities focus on materials, properties, and processes.

**FS HN 242: The US Food System**

(3-0) Cr. 3. S.

*Prereq: FS HN 101 or FS HN 167*

Exploration of the components of our food system including production, processing, and access. A systems approach is used to evaluate the social, environmental, and nutrition/health implications of the US food system. Controversial topics related to how food is produced, processed, marketed and consumed will be discussed.

**FS HN 264: Fundamentals of Nutritional Biochemistry**

(3-0) Cr. 3. F.

*Prereq: FS HN 167; CHEM 163, CHEM 163L; 3 credits in BIOL*

Digestion, absorption, metabolism, and biochemical functions of nutrients. Biochemical aspects of nutrient deficiencies.

**FS HN 265: Nutrition for Active and Healthy Lifestyles**

(3-0) Cr. 3. S.SS.

*Prereq: FS HN 167; (FS HN 264 or 3 credits in BBMB)*

Fundamentals of nutrient metabolism and nutrient requirements. Role of macronutrient metabolism in physical performance and disease prevention. Effect of manipulation of macronutrient metabolism on physical performance and disease prevention. Applications of nutrient metabolism principles to dietary recommendations and planning.

**FS HN 276: Understanding Grape and Wine Science**

(Cross-listed with HORT). (2-2) Cr. 3. S.

A scientific introduction to viticulture (grape-growing) and enology (wine-making) and grape and wine chemistry. Topics include grape biology and cultivars, vineyard management, geography of wine, wine production, wine classification, grape and wine chemistry, wine sensory. No wine tasting.

**FS HN 301: Nutrigenomics: From Basic Science to Translational Impact**

(2-0) Cr. 1. F.

Introduction to the concepts of nutrigenomics and nutrigenetics and how it affects consumers of food, as well as the implications for human diseases. The potential impact of personalized nutrition and full genome sequencing on health maintenance, chronic disease prevention, and the ethical implications of this knowledge will be explored.

**FS HN 305: Food Quality Management and Control**

(2-0) Cr. 2. S.

*Prereq: 3 credits in STAT*

Fundamentals of statistical decision-making processes and quality control procedures used in food quality assurance programs.

**FS HN 311: Food Chemistry**

(3-0) Cr. 3. F.SS.

*Prereq: BBMB 300 or higher; (CHEM 231 or CHEM 331); ENGL 250*

The structure, properties, and chemistry of food constituents and animal and plant commodities.

**FS HN 311L: Food Chemistry Laboratory**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in FSHN 311.*

The laboratory practices of structure, properties, and chemistry of food constituents.

**FS HN 314: Professional Development for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in Culinary Food Science or Food Science; Junior or senior classification.*

Introduction to the roles culinary scientists and food scientists hold within industry. Discussions focused on professional and educational development and emerging issues and trends in the food industry.

**FS HN 315: Professional Skills for Culinary Food Science and Food Science Majors**

(1-0) Cr. 1. F.

*Prereq: Major or minor in FS HN*

Focus on the importance of professional skills and application of those skills to potential job situations. Professional skills include communication, team building, leadership vs. management styles, business ethics, and continual learning. Junior classification recommended.

**FS HN 340: Foundations of Dietetic Practice**

(2-0) Cr. 2. F.

*Prereq: Major in Dietetics (A or H) or Pre-Diet and Exercise; Junior classification*

Introduction to the profession of dietetics and responsibilities associated with dietetic professional practice. Emphasis on exploring career options in dietetics and preparation for supervised practice and graduate school. Leadership and professional career development for the dietitian is addressed through self reflection and creation of materials for post-baccalaureate programs. Professional issues related to dietetic practice include Code of Ethics, legal credentialing and standards of professional practice, leadership and future trends in the profession.

**FS HN 342: World Food Issues: Past and Present**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.SS.

*Prereq: Junior classification*

Issues associated with global agricultural and food systems including ethical, social, economic, environmental, and policy contexts. Investigation of various causes and consequences of overnutrition/ undernutrition, global health, poverty, hunger, access, and distribution. Meets International Perspectives Requirement.

**FS HN 351: Introduction to Food Engineering Concepts**

(3-0) Cr. 3. S.

*Prereq: (FS HN 207; [MATH 160 or MATH 165]; [PHYS 131 or PHYS 231]) or Permission of Instructor*

Methodology for solving problems in food processing and introduction to food engineering concepts including food properties, material and energy balances, sources of energy, thermodynamics, fluid flow, heat transfer, and mass transfer. Credit for only FS HN 351 or CH E 357 may be applied toward graduation for the Food Science major or Food Science minor

**FS HN 360: Advanced Nutrition and the Regulation of Metabolism in Health and Disease**

(3-0) Cr. 3. F.

*Prereq: ENGL 250; FS HN 265*

Physiological and biochemical basis for nutrient needs; assessment of nutrient deficiency and toxicity; examination of nutrient functions and the regulation of metabolism; nutrient-gene interactions; mechanistic role of nutrients in health and disease. 3 credits or concurrent enrollment in 300-level or above Biochemistry recommended. 3 credits in physiology recommended.

**FS HN 361: Nutrition and Health Assessment**

(1-3) Cr. 2. S.

*Prereq: FS HN 265*

The assessment of nutritional status in healthy individuals. Laboratory experiences in food composition and assessment of dietary intake, body composition, and biochemical indices of nutritional status.

**FS HN 362: Nutrition and Health Throughout the Lifecycle**

(3-0) Cr. 3. S.

*Prereq: FS HN 360; credit or concurrent enrollment in BIOL 256 or BIOL 335*

Molecular, biochemical and physiological basis to understand the nutritional aspects of human development and aging. Nutrient needs and various disease states at each stage of human life cycle.

**FS HN 364: Nutrition and Prevention of Chronic Disease**

(3-0) Cr. 3. F.

*Prereq: (BIOL 256; BIOL 256L) or enrolled in NRS major*

Overview of nutrients, their functions, metabolism, food sources and optimal choices for the promotion of health and wellness. Nutrition strategies for the prevention of chronic disease, including cancer, diabetes and obesity, as they apply to individuals or the wider population will be discussed.

**FS HN 365: Obesity and Health**

(3-0) Cr. 3. S.

Multifactorial aspects of obesity, maintenance of healthy weight, and the relationship of weight status and chronic disease prevention. Traditional and novel nutrition and exercise theories as well as current popular diet and exercise trends will be discussed.

**FS HN 366: Communicating Nutrition Messages**

(3-0) Cr. 3. S.

*Prereq: FS HN 264 or FS HN 265*

Theory and application of adult learning and behavior change as it relates to the role of nutrition in health promotion and disease prevention. Discussion of nutrition education and interventions relative to various models. Focus on communication strategies for providing nutrition messages to diverse community audiences using various forms of media and outreach.

**FS HN 367: Medical Terminology for Health Professionals**

(1-0) Cr. 1. F.S.SS.

An independent course focused on medical terminology, abbreviations, and simple clinical mathematical calculations.

**FS HN 392: Food and Nutrition Services Management**

Cr. 3. S.

*Prereq: HSP M 380; HSP M 380L*

Functions and responsibilities related to the management of foodservice systems and nutrition services, including planning, marketing, human resource management, and cost accounting. Only one of HSP M 392 or FS HN 392 may count toward graduation.

**FS HN 403: Food Laws and Regulations**

(2-0) Cr. 2. S.SS.

*Prereq: 3 credits in FS HN at 200-level or above*

History of food law in the US and the world. Relationship between policy, legislation and regulation. Introduction to primary US regulatory agencies and enforcement principles. Discussion of key laws related to food safety and nutrition. Overview of federal and independent research tools and sources of food law.

**FS HN 406: Sensory Evaluation of Food**

(Dual-listed with FS HN 506). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 507). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 408: Dairy Products Evaluation**

(0-3) Cr. 1. S.

Gain experience in identifying quality defects in dairy products including milk, cottage cheese, cheddar cheese, strawberry yogurt, butter, and vanilla ice cream. Intensive training for the National Collegiate Dairy Products Evaluation competition and for dairy product evaluation in the food industry.

**FS HN 410: Food Analysis**

(2-3) Cr. 3. F.

*Prereq: FS HN 311 or CHEM 211*

An introduction to the theory and application of chemical and instrumental methods for determining the constituents of food. Use of standard procedures for food analysis and food composition data bases.

**FS HN 411: Food Ingredient Interactions and Formulations**

(1-3) Cr. 2. F.S.

*Prereq: (FS HN 214 or FS HN 311); 3 credits in STAT*

Application of food science principles to ingredient substitutions in food products. Laboratory procedures for standard formulations and instrumental evaluation, with emphasis on problem-solving and critical thinking.

**FS HN 412: Food Product Development**

(Dual-listed with FS HN 512). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 419: Foodborne Hazards**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**FS HN 420: Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.



**FS HN 421: Food Microbiology Laboratory**

(Cross-listed with MICRO). (1-5) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**FS HN 430: U.S. Health Systems and Policy**

(Dual-listed with FS HN 530). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 435: Analysis of Food Markets**

(Cross-listed with ECON). Cr. 3. S.

*Prereq: ECON 235; ECON 301; STAT 226*

Food market analysis from an economics perspective; food markets and consumption; methods of economic analysis; food industry structure and organization; food and agriculture regulations; labeling; consumer concerns; agricultural commodity promotion. Final project required.

**FS HN 442: Issues in Food and Society**

(2-0) Cr. 2. F.

*Prereq: Sophomore classification*

In-depth discussion, synthesis, and analysis of domestic and global food issues from a systems approach. Mutually reinforcing interactions between culture, biology, and environmental influences on human dietary habits, nutrition and health will be emphasized. Historical and current foodways of cultural groups will be presented with specific attention to understanding cultural differences. Students will demonstrate how to locate, interpret, evaluate and use professional literature to inform about current food and society issues.

**FS HN 445: Strategies for Personal Food Waste Reduction**

(1-0) Cr. 1. S.

*Prereq: Junior classification*

In-depth analysis and discussion of economic, environmental, social, and ethical implications of food waste. Overview of personal food waste reduction strategies, food recycling/recovery, and responsible waste disposal methods. Discussion and application of advocacy tactics for the promotion of food waste reduction in local communities.

**FS HN 460: Global Nutrition and Health**

(Dual-listed with FS HN 560). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations. Meets International Perspectives Requirement.

**FS HN 461: Medical Nutrition and Disease I**

(Dual-listed with NUTRS 561). (4-0) Cr. 4. F.

*Prereq: (BIOL 256 or BIOL 335); FS HN 360; FS HN 361; FS HN 367*

Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and improve health.

**FS HN 463: Community Nutrition and Health**

(3-0) Cr. 3. F.

*Prereq: FS HN 361*

Dual-listed with NUTRS 563. Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups. Discussion of the multidimensional nature of those problems and of community programs addressing them. Grant writing as a means for funding community nutrition program development. Significant emphasis on written and oral communication at the lay and professional level.

**FS HN 464: Medical Nutrition and Disease II**

(4-0) Cr. 4. S.

*Prereq: FS HN 461*

(Dual-listed with NUTRS 564) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and promote health.

**FS HN 466: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 566). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 467: Molecular Basis of Nutrition in Disease Etiology and Health Promotion**

(3-0) Cr. 3. S.

*Prereq:* 3 credits of BBMB 200 or above or *Permission of Instructor*

Understanding the molecular basis for the role of nutrients, nutrient-derivatives, and bioactive compounds in the development, prevention, and treatment of common diseases including diabetes, cancer, vascular disease, obesity, neurological disease, aberrant mineral metabolism, and autoimmune disease. Translating this understanding into practical approaches for improving the health of individuals and populations.

Credit for FS HN 360 suggested.

**FS HN 471: Food Processing**

(3-0) Cr. 3. F.

*Prereq:* A B E 451 or CH E 357 or FS HN 351

Principles and application of food processing using both thermal (ex., blanching, pasteurization, canning, drying, freezing, evaporation, aseptic processing, extrusion) and non-thermal (ex., high pressure, irradiation, pulsed electric field, fermentation) unit operations. Emphasis on microbial inactivation, process heat and mass balance, and numerical problem solving.

**FS HN 472: Food Processing Laboratory**

(1-3) Cr. 2. S.

*Prereq:* FS HN 471

Hands-on and demonstration laboratory activities related to food processing principles and applications using lab and pilot-scale equipment. Laboratory experiences include important food processing operations, e.g., blanching/pasteurization, canning, freezing, drying, corn wet milling, fermentation, baking etc. Emphasis on mass balance, interpreting data, writing reports, and presentations. Occasional field trips.

**FS HN 489: Issues in Food Safety**

(Cross-listed with AN S, HSP M, VDPAM). (1-0) Cr. 1. S.

*Prereq:* Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**FS HN 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490A: Independent Study: Dietetics**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490B: Independent Study: Food Science**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490C: Independent Study: Nutrition**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490D: Independent Study: International Experience**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490E: Independent Study: Entrepreneurship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 490H: Independent Study: Honors**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* *Permission of Instructor*

Independent work in food science, nutrition, or dietetics. A maximum of 6 credits of FS HN 490 may be used toward graduation.

**FS HN 491: Supervised Work Experience**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* *Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491A: Supervised Work Experience: Dietetics**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq:* *Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major. Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491B: Supervised Work Experience: Food Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491C: Supervised Work Experience: Nutrition**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 491D: Supervised Work Experience: Culinary Science**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of Instructor; Permission of Advisor*

Supervised off-campus work experience relevant to the academic major.

Offered on a satisfactory-fail basis only. A maximum of 4 credits of FS HN 491 may be used toward graduation.

**FS HN 492: Research Concepts in Human Nutrition**

(1-3) Cr. 2. F.

*Prereq: (FS HN 360; Senior classification) or Permission of Instructor*

Students will develop and implement research projects with faculty supervision, based on knowledge gained from nutrition, biology and chemistry courses and write a formal science paper to share the results of their research. Students will gain appreciation for independent research and experience creative and innovative aspects of nutrition research.

**FS HN 493: Food Preparation Workshop**

(1-3) Cr. 1-3.

Selected topics in food preparation including scientific principles, culture and culinary techniques. Variable format may include laboratory, recitation, and lecture. Offered on a satisfactory-fail basis only.

**FS HN 495: Practicum**

(1-3) Cr. 2. F.S.

*Prereq: FS HN 366; FS HN 463; Senior classification; major in Nutritional Science-Nutrition and wellness option*

Students will develop, implement and assess a community-based project that engages groups in learning and practicing concepts related to nutrition and wellness. Assessed service learning component. Offered on a satisfactory-fail basis only.

**FS HN 496: Food Science and Human Nutrition Travel Course**

(Dual-listed with FS HN 596). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

(One credit per week traveled and 1 credit for pre-departure class, if offered.) Limited enrollment. Tour and study of food industry, culinary science, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 496A: Food Science and Human Nutrition Travel Course: International travel**

(Dual-listed with FS HN 596A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

**FS HN 496B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 596B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 498: Cooperative Education**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Permission of Department Chair*

Required for students completing professional work periods in a cooperative education program. Students must register prior to commencing each work period. Offered on a satisfactory-fail basis only.

**FS HN 499: Undergraduate Research**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Research under staff guidance. A maximum of 6 credits of FS HN 499 may be used toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:****FS HN 506: Sensory Evaluation of Food**

(Dual-listed with FS HN 406). (2-3) Cr. 3. F.

*Prereq: FS HN 305; FS HN 411; 3 credits in STAT*

Sensory evaluation techniques used to evaluate the appearance, aroma, flavor, texture and acceptability of foods. Relationships between sensory and instrumental measurements of color and texture. Work independently and cooperatively (in a team) to identify sensory evaluation objectives, write hypotheses, design and conduct experiments, and analyze and interpret data.

**FS HN 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with FS HN 407). (Cross-listed with MICRO). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**FS HN 508: Consumer Perceptions and Nutrition Communication**

(2-0) Cr. 2. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current consumer food and nutrition trends. Critical analysis of consumer perceptions relative to current research base. Use of various media to create effective nutrition messages for consumers. Activities designed to meet accreditation standards.

**FS HN 509: Sensory Evaluation of Wines**

Cr. 2. S.

*Prereq: Must be at least 21 years of age; senior or graduate status.*

Principles of sensory evaluation and their application to wine evaluation. Sensory testing methods such as discrimination tests, ranking, descriptive analysis and scoring of wines will be covered. Students will have the opportunity to evaluate and learn about major types and styles of wines of the world. Lab fee.

**FS HN 511: Integrated Food Science**

(3-0) Cr. 3. F.

*Prereq: 3 credits in each of organic chemistry, physics, mathematics, and microbiology.*

Critical review of the key principles of food science and applications in the chemistry, microbiology, and processing of food. Understanding of the impact of processing on the quality of foods with respect to composition, quality and safety.

**FS HN 512: Food Product Development**

(Dual-listed with FS HN 412). (1-6) Cr. 3. S.

*Prereq: FS HN 411; Senior classification*

Principles of developing consumer packaged food products. Application of skills gained in food chemistry, formulation, quality, sensory and processing. Some pilot plant experiences. Emphasis on teamwork and effective communication.

**FS HN 516: Advanced Nutrition I**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Examination of current literature relative to molecular, cellular, and physiologic aspects of macronutrient and micronutrient metabolism. Integration of current evidence-based information, including peer-reviewed literature, to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, MICRO, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**FS HN 518: Advanced Nutrition II**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Principles of research design/methods and interpreting results/statistics in the current peer-reviewed scientific literature. Critical evaluation of the evidence-base to inform nutrition practice. Activities designed to meet accreditation standards.

**FS HN 521: Microbiology of Food**

(2-0) Cr. 2. S.SS.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Identification, enumeration, and characterization of bacteria, yeasts, and mold associated with foods and food processing. Effects of physical and chemical agents on micro-organisms will be studied. Microbiological problems in food spoilage, food preservation, food fermentation, and food-borne disease will be discussed.

**FS HN 522: Advanced Food Microbiology and Biotechnology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Food microbiology, a course in biochemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Basic principles in biotechnology and applied food microbiology, including current topics of interest in food biotechnology. Introduction to recombinant DNA techniques and how they are applied to genetically modify microorganisms, the use of nucleic acids as tools of rapid detection of microorganisms in foods, basic enzyme immobilization and down-stream processing techniques, and regulatory aspects of food biotechnology.

**FS HN 523: A Multidisciplinary Overview of Food Safety and Security**

(2-0) Cr. 2. F.SS.

*Prereq: A course in biology or chemistry; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Multidisciplinary food safety and security perspectives provided by numerous subject matter experts. Topics include food safety policy, ag bioterrorism, border security, animal ID, food defense and site security, risk analysis, crisis communication, epidemiology, HACCP, and more.

**FS HN 524: Food Microbiology**

(3-0) Cr. 3. F.

*Prereq: A course in microbiology with laboratory; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Food Microbiology looks at the nature, physiology, and interactions of microorganisms in foods. The course is an introduction to food-borne diseases, the effect of food processing systems on the microflora of foods, principles of food preservation, food spoilage, and foods produced by microorganisms. Additionally, the course looks at food plant sanitation and criteria for establishing microbial standards for food products.

**FS HN 525: Principles of HACCP**

(2-0) Cr. 2. F.

*Prereq: Undergraduate biology and chemistry courses; enrollment in GP-IDEA Food Safety and Defense Certificate or permission of instructor.*

A comprehensive study of the Hazard Analysis and Critical Control Point System and its application in the food industry.

**FS HN 526: Ethnic Foods: Food Safety, Food Protection and Defense**

(2-0) Cr. 2. SS.

*Prereq: Graduate standing; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Understanding of the various factors that impact safety of ethnic and imported ethnic foods; knowledge about the handling, preparation, processing and storage of ethnic and imported foods and food products; science-based characterization of representative ethnic foods.

**FS HN 527: Microbiology of Fermented Foods**

(2-0) Cr. 2. SS.

*Prereq: Food microbiology; enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

Microbiology of fermented foods covers the physiology, biochemistry, and genetics of microorganisms important in food fermentations. The course looks at how microorganisms are used in fermentations and the effects of processing and manufacturing conditions on production of fermented foods.

**FS HN 528: Food Protection and Defense-Essential Concepts**

(2-0) Cr. 2. S.

*Prereq: Enrollment in GP-IDEA Food Safety and Defense Graduate Certificate or permission of instructor.*

This course will provide students with an understanding of the principles required in a food defense program for a food manufacturing, warehousing or distribution center. The topics covered include: defining threats and aggressors; the Bioterrorism Act; food defense teams; vulnerability assessments; security programs; recall and traceability basics; security inspections; crisis management; emergency preparedness; and workplace violence.

**FS HN 530: U.S. Health Systems and Policy**

(Dual-listed with FS HN 430). (2-0) Cr. 2. F.S.

*Prereq: Junior or Senior or Graduate classification*

Introduction to public policy for health care professionals. Emphasis on understanding the role of the practitioner for participating in the policy process, interpreting government policies and programs such as Medicare and Medicaid, determining reimbursement rates for eligible services, and understanding licensure and accreditation issues. Discussion and exploration of federal, state and professional policy-relevant resources.

**FS HN 533: Diet and Integrative Therapies for Prevention and Treatment of Diseases**

(2-0) Cr. 2. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Explore the role of specific nutrients, dietary bioactive compounds and integrative therapies on disease prevention and treatment. Activities designed to meet accreditation standards.

**FS HN 537: Leadership and Management in Dietetics**

(3-0) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program*

Application of leadership and management theories and approaches relevant to dietetics practice. Use of self-reflection and self-assessment to assist in recognition and development of leadership behaviors. Activities designed to meet accreditation standards.



**FS HN 538: Advanced Medical Nutrition Therapy**

(3-0) Cr. 3. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Nutritional biochemistry and physiology related to selected pathophysiology of disease with emphasis on treatment of complex medical problems and current issues. The nutrition care process will be utilized. Evidenced-based practice will be integrated into each disease state covered to optimize nutritional status and promote health. Activities designed to meet accreditation standards.

**FS HN 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**FS HN 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**FS HN 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**FS HN 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**FS HN 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**FS HN 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**FS HN 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, GDCB, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**FS HN 544: Pediatric Clinical Nutrition**

(3-0) Cr. 3. F.

*Prereq: Enrollment in GP-IDEA MFCS in Dietetics*

Examines the physiological, biochemical and nutritional aspects of disease processes relevant to infants and children up to 18 years of age. Discussion of medical nutrition therapy for a variety of medical conditions in this population including inborn errors of metabolism, food hypersensitivity, obesity, and diseases of the major organ systems.

**FS HN 554: Supervised Experience in Food Systems Management**

(0-22) Cr. 3. SS.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in food service and management. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 555: Supervised Experience in Community Nutrition**

(0-18) Cr. 3. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in community nutrition. Capstone project. Experiences and activities designed to meet accreditation standards.



**FS HN 556: Supervised Experience in Medical Nutrition Therapy**

(0-22) Cr. 5. S.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Supervised experiential learning in medical nutrition therapy. Capstone project. Experiences and activities designed to meet accreditation standards.

**FS HN 560: Global Nutrition and Health**

(Dual-listed with FS HN 460). (3-0) Cr. 3. S.

An overview of global nutrition issues, including the sociocultural, biological, economic, and environmental context of nutrition related topics. The etiology, epidemiology, and program/policy responses to issues will be presented. Areas to be covered include childhood malnutrition, growth stunting, micronutrient deficiencies, parasites and nutrition, sanitation, and obesity and chronic disease incidence in developing countries. Participatory course, students will engage in a series of class activities, discussions, and presentations.

Meets International Perspectives Requirement.

**FS HN 562: Advanced Nutrition Assessment**

(4-0) Cr. 4. F.

*Prereq: Acceptance in the Master of Professional Practice in Dietetics program.*

Overview and practical applications of methods for assessing nutritional status, including: theoretical framework of nutritional health and disease, dietary intake, biochemical indices, nutrition focused physical exam and body composition across the lifecycle. Activities designed to meet accreditation standards.

**FS HN 566: Nutrition Counseling and Education Methods**

(Dual-listed with FS HN 466). (2-2) Cr. 3. F.S.

*Prereq: FS HN 361 and FS HN 362*

Application of counseling and learning theories with individuals and groups in community and clinical settings. Includes discussion and experience in building rapport, assessment, diagnosis, intervention, monitoring, evaluation, and documentation. Literature review of specific counseling and learning theories.

**FS HN 575: Processed Foods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 214 or FS HN 311; a course in nutrition*

This course will examine effect of industrial and domestic food processing on the nutrient content of food and risk of developing chronic disease.

**FS HN 580: Orientation to Food Science and Nutrition Research**

(1-0) Cr. 1. F.

Orientation to and discussion of research interests in food science and nutrition. Discussion of policy and ethical issues in the conduct of research. Intended for entering students in FS HN. Offered on a satisfactory-fail basis only.

**FS HN 581: Seminar**

(1-0) Cr. 1. S.

Discussion and practice of oral presentation of scientific data in a professional setting. Discussion of issues related to data presentation. Intended for graduate students in their first or second semester in FS HN.

**FS HN 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with GERON, NEURO, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**FS HN 590: Special Topics**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590A: Special Topics: Nutrition**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590B: Special Topics: Food Science**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 590C: Special Topics: Teaching**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

**FS HN 596A: Food Science and Human Nutrition Travel Course: International travel**

(Dual-listed with FS HN 496A). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students. Meets International Perspectives Requirement.

**FS HN 596B: Food Science and Human Nutrition Travel Course: Domestic travel**

(Dual-listed with FS HN 496B). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(One credit per week traveled.) Limited enrollment. Tour and study of food industry, dietetic and nutritional agencies in different regions of the world. Pre-travel session arranged. Travel expenses paid by students.

**FS HN 599: Creative Component**

Cr. arr.

Nonthesis option only.

**Courses for graduate students:****FS HN 606: Advanced Food Analysis and Instrumentation**

(2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 410, or FS HN 511 or equivalent.*

Instrumental methods for measuring chemical and physical properties of foods, food quality and functionality. Techniques for methods development, sample preparation, optimization of operating conditions, and data analysis needed to obtain accurate, reproducible results by means of instrumentation.

**FS HN 611: Advanced Food Processing**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: FS HN 311, or FS HN 471/472 or equivalent, or FS HN 511.*

Recent advances in the science and technology of food processing and preservation; examples include both thermal and non-thermal processes, including cold plasma, nanotechnology, and extrusion. Advances in extraction and separation technologies, by-product utilization, and sustainability in food processing industry will also be discussed. Students to research on select topics and present.

**FS HN 612: Advanced Food Chemistry**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FS HN 311, or FS HN 411, or FS HN 511, or BBMB 404, or equivalent.*

Structure, chemical and physical properties of lipids, proteins and carbohydrates, and their food and industrial applications. Changes in functionalities during processing and storage.

**FS HN 626: Advanced Food Microbiology**

(Cross-listed with MICRO, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**FS HN 627: Rapid Methods in Food Microbiology**

(Cross-listed with MICRO, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**FS HN 653: Food and Agricultural Traceability**

(3-0) Cr. 3. F.

*Prereq: Enrollment in The Ivy Executive MBA program within the Ivy College of Business at Iowa State University*

Current issues and concepts of food and agricultural product traceability in the U.S., from production to consumption. Food types, microbial agents of concern, adulterants, disease investigations, risk analysis, risk mitigation, prevention and regulatory policy and advocacy. Travel to Washington, D.C.

**FS HN 681: Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

Presentation of thesis or dissertation research. Must be taken once for each graduate program; once for the M.S. program and once for the Ph.D. program.

**FS HN 682: Seminar Reflection**

Cr. R. Repeatable. F.S.

Active listening and critical thinking activities related to research seminars in food science and human nutrition. Required each semester for all FSHN graduate students. Electronic documentation.

**FS HN 690: Special Problems**

Cr. arr. Repeatable. F.S.SS.

*Prereq: FS HN 502 or FS HN 503 or FS HN 504 or FS HN 553 or FS HN 554***FS HN 695: Grant Proposal Writing**

(Cross-listed with NUTRS). (1-0) Cr. 1. F.

*Prereq: 3 credits of graduate course work in food science and/or nutritional sciences*

Grant proposal preparation experiences including writing and critiquing of proposals and budget planning. Understanding the grant funding process from federal, foundation, and commodity agencies. Includes preparing a grant for possible submission and participation in the review of proposals. Discussion of the role of successful grant writing in career development.

**FS HN 699: Research in Food Science and Technology**

Cr. arr. Repeatable. F.S.SS.

Offered on a satisfactory-fail basis only.

## Forestry (FOR)

***Any experimental courses offered by FOR can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**FOR 201: Forest Biology**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 202; FOR 203; FOR 204; FOR 205; FOR 206*

Discussion of ecological concepts, individual tree structure and growth, variation and diversity in tree populations. Physical environment of trees and forests, ecological processes in forest communities, and introduction to different regional forest communities.

**FOR 202: Sustainable Materials: Wood Utilization**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 203; FOR 204; FOR 205; FOR 206*

Basis for use of wood as an industrial raw material for lumber, composites, pulp and paper, energy and chemicals. Implications of use of alternative renewable and non-renewable materials for societal infrastructure and consumer goods.

**FOR 203: Resource Measurements/Evaluation**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in (FOR 201; FOR 202; FOR 204; FOR 205; FOR 206); MATH 140*

Survey techniques involved in quantification, valuation, and evaluation of tree and stand growth and other variables in the forest environment (e.g., recreational use, wildlife habitat value, biomass, and solid wood).

**FOR 204: Forest Ecosystem Decision-Making**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 205; FOR 206*

Methods of decision-making related to forest ecosystems including communications, teams and conflict resolution. Current issues relating to public, private, and urban forests; quantification of processes, services, and goods produced by the forest and expected by the public such as wildlife, water, range, recreation, wilderness, biodiversity, as well as wood and fiber products.

**FOR 205: Integrated Forestry Laboratory**

(0-8) Cr. 3. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 204; FOR 206*

Field and laboratory exercises integrating the evaluation and management of forest goods, services, and the processing of wood products.

**FOR 206: Fall Forestry Camp**

Cr. 4. F.

*Prereq: Concurrent enrollment in FOR 201; FOR 202; FOR 203; FOR 204; FOR 205*

Three-week field camp to address topics and issues covered in 201, 202, 203, 204, and 205.

**FOR 280: Wood Properties and Identification**

(3-3) Cr. 4. S.

Properties of wood and how they relate to its successful use.

Comparative anatomical characteristics, scientific nomenclature, and hand lens identification of commercially important North American woods.

**FOR 283: Pesticide Application Certification**

(Cross-listed with AGRON, ENT, HORT). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**FOR 290: Special Problems**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290A: Special Problems: Leadership in Forestry Teams (LIFT) Learning Community**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290B: Special Problems: Forest Ecosystem Management**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290C: Special Problems: Natural Resource Conservation**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290D: Special Problems: Urban and Community Forestry**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 290E: Special Problems: Wood Science and Technology**

Cr. 1-4. Repeatable.

*Prereq: Freshman or Sophomore classification; Permission of Instructor*

**FOR 302: Silviculture**

(3-3) Cr. 4. S.

*Prereq: A ECL 312 or FOR 201 or NREM 301*

Manipulation of forest vegetation based on ecological principles for the production of goods and services.

**FOR 356: Dendrology**

(Cross-listed with BIOL). (2-2) Cr. 3. F.

*Prereq: BIOL 211*

Identification and ecology of North American woody plant species. Importance of woody plants in timber production and wildlife habitat. Historical conditions of North American forest regions will also be addressed.

**FOR 358: Forest Herbaceous Layer: Ecology and Identification.**

(0.5-1) Cr. 1. S.

*Prereq: BIOL 211*

Survey of the major plant families, general, and representative species of the forest herbaceous layer. Functional ecology and restoration.

**FOR 416: Forest Insects and Diseases**

(Cross-listed with PL P). (2-2) Cr. 3. F.

*Prereq: BIOL 211; 4 additional credits in life sciences*

Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests. Laboratory experience working with insect and fungal pests of trees.

**FOR 442: Dynamics of Forest Stands**

(Dual-listed with FOR 542). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FOR 302; NREM 301; (STAT 101 or STAT 104)*

Change in forest species composition and structure at the stand and landscape scales resulting from site quality, tree growth, competition, succession, and disturbance. Methods for assessing tree growth and reconstructing past stand development. Applications to forest and savanna management.

**FOR 451: Forest Resource Economics and Quantitative Methods**

(3-3) Cr. 4. S.

*Prereq: FOR 203*

Application of economic principles to forest resource management considering both market and non-market goods and services. Methods of identifying and specifying problems in the management and use of forest resources. Application of mathematical and statistical models to the solution of managerial problems.

**FOR 452: Ecosystem Management**

(Dual-listed with FOR 552). (Cross-listed with NREM). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**FOR 454: Forestry Practicum**

(1-4) Cr. 3. S.

*Prereq: Senior classification or Permission of Instructor*

Integrated decision-making related to the conservation, management, and preservation of private and public forests, wildlands, urban/community forests, and/or the production and utilization of wood products. Student teams work with a client and develop management plans that incorporate ecological, social, economic, ethical, and institutional/political factors. Effective teamwork, written/oral/visual communication, and problem-solving stressed. Multiple trips to project site and client.

**FOR 475: Urban Forestry**

(Cross-listed with HORT). (2-3) Cr. 3. F.

*Prereq: Junior or Senior classification; 3 credits in BIOL*

Discussion of establishment and management of woody perennials in community-owned urban greenspaces, consideration of urban site and soil characteristics, plant physiology, plant culture, urban forest valuation, inventory methods, species selection, and urban forest maintenance (health care and pest management).

**Courses primarily for graduate students, open to qualified undergraduates:**

**FOR 542: Dynamics of Forest Stands**

(Dual-listed with FOR 442). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: FOR 302; NREM 301; (STAT 101 or STAT 104)*

Change in forest species composition and structure at the stand and landscape scales resulting from site quality, tree growth, competition, succession, and disturbance. Methods for assessing tree growth and reconstructing past stand development. Applications to forest and savanna management.

**FOR 552: Ecosystem Management**

(Dual-listed with FOR 452). (Cross-listed with NREM). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**FOR 599: Creative Component**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599A: Creative Component: Forest Biology**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599B: Creative Component: Forest Biometry**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599C: Creative Component: Forest and Recreation Economics**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599D: Creative Component: Forest Management and Administration**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 599E: Creative Component: Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**Courses for graduate students:****FOR 696: Research Seminar**

(Cross-listed with AGRON, BBMB, GDCB, HORT, PLBIO). Cr. 1. Repeatable.  
 Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**FOR 699: Research**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699A: Research: Forest Biology - Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699B: Research: Forest Biometry**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699C: Research: Forest Economics**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699D: Research: Forest Management and Administration**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699E: Research: Wood Science**

Cr. 1-12. Repeatable, maximum of 12 credits.

**FOR 699F: Research: Plant Physiology**

Cr. 1-12. Repeatable, maximum of 12 credits.

## French (FRNCH)

***Any experimental courses offered by FRNCH can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****FRNCH 101: Elementary French I**

(4-0) Cr. 4. F.SS.

Beginning level development of reading, writing, listening comprehension, and speaking in French, within the context of French culture.

**FRNCH 102: Elementary French II**

(4-0) Cr. 4. S.SS.

*Prereq: FRNCH 101*

Beginning level development of reading, writing, listening comprehension, and speaking in French, within the context of French culture.

Meets International Perspectives Requirement.

**FRNCH 201: Intermediate French I**

(4-0) Cr. 4. F.

*Prereq: FRNCH 102*

Intermediate level development of reading, writing, listening comprehension, and speaking in French within the context of French culture.

Meets International Perspectives Requirement.

**FRNCH 202: Intermediate French II**

(4-0) Cr. 4. S.

*Prereq: FRNCH 201*

Intermediate level development of reading, writing, listening comprehension, and speaking in French within the context of French culture.

Meets International Perspectives Requirement.

**FRNCH 203: Intermediate French Grammar and Conversation**

Cr. 4. F.

*Prereq: FRNCH 201*

Practice in oral communication within the context of French language and cultures for professions. Best-suited for students with a solid foundation in basic French grammar. Only one of FRNCH 202 or 203 may count toward graduation.

**FRNCH 301: Language, Culture, Contexts**

(3-0) Cr. 3. F.

*Prereq: FRNCH 202*

Emphasis on developing language proficiency and skills in reading and writing. Selective review of grammar within the context of cultural and literary prose.

Meets International Perspectives Requirement.

**FRNCH 302: Text and Media Analysis**

(3-0) Cr. 3. S.

*Prereq: FRNCH 301*

Readings in French prose, theater and poetry. Introduction to close reading and analysis. Development of reading and writing skills for upper-level courses.

Meets International Perspectives Requirement.

**FRNCH 304: French for Global Professionals**

(3-0) Cr. 3.

*Prereq: FRNCH 202*

Communication in business and professional contexts in French-speaking countries. Development of effective communication strategies and project management in the workplace. Cultural contexts of business and professional practice. Emphasis on working across French-American cultures. Preparation for internships.

Meets International Perspectives Requirement.

**FRNCH 305: French Conversation**

(3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment in FRNCH 301*

Intensive conversational and listening practice emphasizing contemporary France and the Francophone world. Native or near-native speakers are not eligible to enroll.

Meets International Perspectives Requirement.

**FRNCH 310: French Pronunciation**

(1-0) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in FRNCH 202*

Practice and theory of correct pronunciation of sounds in French.

Correlation between sound and spelling in French. Relationship between pronunciation and grammar.

**FRNCH 320: France Today**

(3-0) Cr. 3.

*Prereq: FRNCH 202*

Selected topics dealing with contemporary French society and culture.

Meets International Perspectives Requirement.

**FRNCH 326: French and Francophone Film**

(3-0) Cr. 3. Repeatable.

*Prereq: FRNCH 301*

In-depth study of a selected filmmaker, genre, or movement. Emphasis on analytical interpretation and relationship between film and French or Francophone culture, history, and society. Counts toward World Film Studies Minor.

Meets International Perspectives Requirement.

**FRNCH 340: Cultural Expressions in the French-Speaking World**

(3-0) Cr. 3. Repeatable.

*Prereq: Credit or concurrent enrollment in FRNCH 302*

Cultural approaches to selected topics, genres, movements, or voices in French language, literatures, and media. Emphasis on close reading and discussion.

Meets International Perspectives Requirement.

**FRNCH 370: French Studies in English**

(3-0) Cr. 3-4. Repeatable.

Author, genre, or period study in French or Francophone history, literature, or culture. Three credits: readings, discussions and papers in English; open to all students. Four credits: required for French concentration credit, supplementary readings and written course work in French. For enrollment in fourth credit, 6 credits in FRNCH at 300-level.

Meets International Perspectives Requirement.

**FRNCH 370F: Studies in English Translation: French Topics on Women and Gender Studies**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable.

Topics vary according to faculty interest. Readings, discussions, and papers in English.

Meets International Perspectives Requirement.

**FRNCH 375: Francophone Studies in English**

Cr. 3-4. Repeatable.

Author, genre, period study, or contemporary topics in Francophone history, literature, politics, or culture. Readings, discussions, and papers in English. Required for French concentration credit (4th credit), supplementary readings and written course work in French. For enrollment in fourth credit, 6 credits in FRNCH at 300-level.

Meets International Perspectives Requirement.

**FRNCH 378: French Cinema**

(2-2) Cr. 3-4. Repeatable.

Analysis and interpretation of film in French society. Topics vary according to faculty interest. Film directors, genres, movements (e.g. The New Wave), historical survey, aesthetics, and cinematography. Three credits: readings, discussions and papers in English; open to all students. Four credits: required for French concentration credit, supplementary readings and written course work in French. Counts toward World Film Studies Minor. For enrollment in fourth credit, 6 credits in FRNCH at 300-level.

Meets International Perspectives Requirement.

**FRNCH 395: Study Abroad**

Cr. 1-10. Repeatable. SS.

*Prereq: 12 credits in FRNCH*

Formal class instruction at level appropriate to the student's training, augmented by practical living experience.

Meets International Perspectives Requirement.

**FRNCH 440: Seminar in French and/or Francophone Studies**

(3-0) Cr. 3. Repeatable.

*Prereq: FRNCH 340*

Seminar in French and/or Francophone literatures, civilizations, or cultural studies. Topics vary according to faculty interest.

Meets International Perspectives Requirement.

**FRNCH 476: French Culture and Society in English**

(3-0) Cr. 3-4. S.

Key moments and themes in French society and culture up to the modern era. Subjects vary according to faculty interest. Readings, discussions, and papers in English.

Meets International Perspectives Requirement.



**FRNCH 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 9 credits.

*Prereq: Permission of Department Chair*

Designed to meet the needs of students who wish to focus on areas other than those in which courses are offered. No more than 9 credits in Frnch 490 may be counted toward graduation.

**FRNCH 499: Internship in French**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: 9 credits in FRNCH at the 300-level; Permission of Advisor;*

*Permission of WLC Internship Coordinator*

Work experience using French language skills in the public or private sector, combined with academic work under faculty supervision. Offered on a satisfactory-fail basis only. No more than 3 credits of Frnch 499 may be applied to the major.

**Courses primarily for graduate students, open to qualified undergraduates:**

**FRNCH 590: Special Topics in French**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level French*

**FRNCH 590A: Special Topics in French: Literature or Literary Criticism**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level French*

**FRNCH 590B: Special Topics in French: Linguistics**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level French*

**FRNCH 590C: Special Topics in French: Language Pedagogy**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level French*

**FRNCH 590D: Special Topics in French: Civilization**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level French*

## Genetics (GEN)

*Any experimental courses offered by GEN can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**GEN 110: Genetics Orientation**

(1-0) Cr. 1. F.

This course is intended for first year students and others new to the genetics major. Discussion of university policies and resources, requirements of the major, career opportunities, and other topics related to the first year experience. Only one of GEN 110 or 112 may count toward graduation.

**GEN 112: Genetics Orientation for Transfer Students**

(0.5-0) Cr. 0.5. S.

Eight-week course for external transfer students and internal change of major students. Discussion of university policies and resources, requirements of the major, and career opportunities. Only one of GEN 110 or 112 may count toward graduation.

**GEN 298: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; sophomore classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 313: Principles of Genetics**

(Cross-listed with BIOL). (3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Introduction to the principles of transmission and molecular genetics of plants, animals, and bacteria. Recombination, structure and replication of DNA, gene expression, cloning, quantitative genetics, and population genetics. Students may receive graduation credit for no more than one of the following: Gen 260, Gen 313 and 313L, Gen 320, Biol 313 and 313L, and Agron 320.

**GEN 313L: Genetics Laboratory**

(Cross-listed with BIOL). (0-3) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 313*

Laboratory to accompany 313. Students may receive graduation credit for no more than one of the following: Biol 313 and 313L, Gen 260, Gen 313, Gen 320, and Agron 320.

**GEN 320: Genetics, Agriculture and Biotechnology**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

*Prereq: BIOL 212*

Transmission and molecular genetics with an emphasis on applications in agriculture, the structure and expression of the gene, how genes behave in populations and how recombinant DNA technology can be used to improve agriculture. Credit for graduation will not be allowed for more than one of the following: Gen 260, 313, 320 and Biol 313 and 313L.

**GEN 322: Introduction to Bioinformatics and Computational Biology**

(Cross-listed with BCBIO, BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 212*

Genome sequencing, assembly, structural and functional annotation, and comparative genomics. Investigating these topics will develop skills in programming and scripting (Perl and/or Python), the use of biological databases, sequence alignment, similarity search, identification of sequence patterns, construction of phylogenetic trees, and comparative genomics.

**GEN 340: Human Genetics**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 313 or GEN 313*

Fundamental concepts and current issues of human genetics. Human chromosome analysis, pedigree analysis, gene mapping, the human genome project, sex determination, genetics of the immune system, genetics of cancer, gene therapy, the genetic basis of human diversity, eugenics.

**GEN 349: The Genome Perspective in Biology**

(Cross-listed with BIOL). (3-2) Cr. 4. S.

*Prereq: GEN 313 or GEN 320*

Analysis of genome, RNA, and protein data using computer technology to answer biological questions on topics ranging from microbial diversity to human health. An introduction for students in the life sciences to the fields of genomics, bioinformatics and systems.

**GEN 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; junior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 401: Bioinformatics of Sequences**

(Cross-listed with BCBIO, BIOL, COM S). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: (BCBIO 322; [COM S 127 or COM S 227]; [MATH 160 or MATH 165]; [MATH 166 or STAT 301]; [STAT 101 or STAT 104 or STAT 330]) or Permission of Instructor*

Application of computer science and statistics to molecular biology with a significant problem-solving component, including hands-on programming using Python to solve a variety of biological problems. String algorithms, sequence alignments, homology search, pattern discovery, genotyping, genome assembly, genome annotation, comparative genomics, protein structure.

**GEN 402: Microbial Genetics and Genomics**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**GEN 406: Bioinformatics of OMICS**

(Cross-listed with BCBIO, BIOL, COM S). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Introduction to cutting edge OMICS analyses including transcriptome, proteome, metabolome, DNA-protein interactome, protein-protein interactome and methylome. Genomic analysis including transcriptome analysis, cancer genomics, comparative genomics, and regulatory network analysis.

**GEN 409: Molecular Genetics**

(3-0) Cr. 3. F.

*Prereq: BIOL 313 or GEN 313*

Principles of molecular genetics and analysis of gene expression, including elements of the Central Dogma (DNA replication, transcription, and translation) and gene regulation. Utilizing examples from the primary literature to illustrate experimental design, data analysis, and interpretation.

**GEN 410: Analytical Genetics**

(3-0) Cr. 3. S.

*Prereq: BIOL 313 or GEN 313*

The principles and practice of genetic analysis. Mendelian genetic analysis, mutational, transgenic, and genomic analysis of gene function, linkage and gene mapping, chromosomal aberrations, aneuploidy and polyploidy, extrachromosomal inheritance, analysis of genetic pathways.

**GEN 462: Evolutionary Genetics**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 315*

The population and quantitative genetic basis of evolutionary processes. The role of genetic variation in natural selection and the influences of random processes on evolutionary change. The determinants of phenotype.

**GEN 490: Independent Study**

Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: GEN 313; Junior or Senior classification; Permission of Instructor*  
Independent study in any area of genetics. Students may use no more than 9 credits of university-wide 490 credits (including Gen 490) toward the total of 120 credits required for graduation.

**GEN 491: Undergraduate Seminar, Professional Practice in Genetics Disciplines**

(1-0) Cr. 1. F.S.

*Prereq: Junior Classification*

Intended to develop career objectives and obtain positions appropriate to the goals of students, in particular juniors, in preparation for position searches in the senior year. Discussion of various career paths in genetics disciplines; identification of experiences to enhance entry to specific careers; exposure to professional practices not covered elsewhere including literature database management, scientific figure preparation for publication, the peer-review journal system, the federal competitive grants system, laboratory budgets and management, authorship and collaborations, etc.; preparation of effective curricula vitae and application letters; and verbal scientific discourse appropriate to interview interactions and other professional settings.

**GEN 492: Undergraduate Teaching Experience**

Cr. 1-2. Repeatable, maximum of 9 credits. F.S.

*Prereq: BIOL 212; Junior or Senior classification; Permission of Instructor*  
For students registering to be undergraduate laboratory or classroom assistants. Offered on a satisfactory-fail basis only. No more than 2 credits of GEN 492 may be applied toward the Genetics advanced course requirement.

**GEN 495: Special Topics in Genetics**

(1-0) Cr. 1-3. Repeatable, maximum of 3 credits. F.S.

*Prereq: GEN 313; Permission of Instructor*

Content varies from year to year. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.

**GEN 496: Attendance and Critique of Genetics Seminars**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.

*Prereq: GEN 313; Junior or Senior classification; Permission of Instructor*  
Attendance and critique of departmental seminars in BBMB, GDCB, or EEOB. Offered on a satisfactory-fail basis only. Genetics students may use no more than 9 credits of university-wide 490 - 499 credits toward the total of 120 credits required for graduation.

**GEN 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of department cooperative education coordinator; senior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEN 499: Genetics Research**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: GEN 313; Junior or Senior classification; Permission of Instructor*  
Independent research in any area of genetics. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.

**GEN 499H: Genetics Research for Honors**

Cr. 1-5. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: GEN 313; Junior or Senior classification; Permission of Instructor*  
Independent research in any area of genetics; for Honors students only. Genetics students may use no more than 9 credits of university-wide 490-499 credits toward the total of 120 credits required for graduation.

## Genetics (GENET)

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[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**GENET 539: Ethics and Biological Sciences**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

Introduction to Bioethics through case studies, discussion of contemporary work on central bioethics topics, and discussion of important emerging ethical issues associated with recent research or technological development. Issues covered will vary somewhat from year to year, but will include at least some of the following: ethics and responsible research practice, animal ethics and the use of animals in teaching and research, cloning, human reproductive and stem cell research, regulation of genetically modified crops and foods, plant biotechnology, gene patents. Students will be divided into groups to develop their own case study, to be presented in class at the end of the term. Offered on a satisfactory-fail basis only.

**GENET 590: Special Topics**

Cr. arr. Repeatable. F.S.SS.

Contact individual faculty for special projects or topics. Graded.

**GENET 591: Workshop in Genetics**

(1-0) Cr. 1. Repeatable. F.

*Prereq: Permission of instructor*

Current topics in genetics research. Lectures by off-campus experts. Students read background literature, attend preparatory seminars, attend all lectures, meet with lecturers.

**Courses for graduate students:****GENET 690: Graduate Student Seminar in Genetics**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Permission of instructor*

Research presentations by students to improve their ability to: orally present scientific work in a clear and meaningful way, critically evaluate oral presentations, and give and receive constructive criticism. Students may enroll in one seminar per school year.

**GENET 691: Faculty Seminar in Genetics**

(1-0) Cr. 1. Repeatable. F.

*Prereq: Permission of instructor*

Faculty research seminars that introduce students to the variety of genetics research projects on campus and provide an opportunity for students to become engaged in the scientific presentation to the point where they can think critically and ask meaningful questions.

**GENET 692: Conceptual Foundations of Genetics**

(1-0) Cr. 1. F.

*Prereq: Permission of instructor*

Landmark papers in the development of genetics concepts. Papers are presented and discussions led by students, guided and mentored by the instructors. Instructors provide a broad overview and history of the development of fundamental concepts in genetics.

**GENET 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with AGRON, BCB, E E, ENGR, M E). (3-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq: Graduate student status and completion of at least one semester of graduate coursework.*

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**GENET 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.SS.

Graduate research projects performed under the supervision of selected faculty members in the graduate Genetics major. Offered on a satisfactory-fail basis only.

**GENET 699: Research**

Cr. arr. Repeatable. F.S.SS.

Research.

## Genetics, Development and Cell Biology (GDCB)

***Any experimental courses offered by GDCB can be found at:***

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:****GDCB 510: Transmission Genetics**

(3-0) Cr. 3. F.

*Prereq: GEN 410 or graduate standing*

In-depth investigations of modern research practices of transmission genetics. Designed for students interested in genetic research. Topics include: Mendelian genetic analysis, analysis of genetic pathways, mutational analysis of gene function, chromosomal mechanics, genetic mapping, epigenetic inheritance, human genetic analysis.

**GDCB 511: Advanced Molecular Genetics**

(Cross-listed with MCDB). (3-0) Cr. 3. S.

*Prereq: BIOL 313 and BBMB 405*

Mechanisms of molecular genetic processes in eukaryotes and prokaryotes, including DNA replication and repair, transcription, translation and regulation of gene expression. Critical evaluation and discussion of current primary literature, methodologies and experimental data.

**GDCB 513: Plant Metabolism**

(Cross-listed with PLBIO). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BIOL 330, PHYS 131, CHEM 331; one semester of biochemistry recommended*

Photosynthesis, respiration, and other aspects of plant metabolism.

**GDCB 528: Advances in Molecular Cell Biology**

(Cross-listed with MCDB). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Courses in general cell biology and biochemistry*

Cell biological processes including cell signaling, cell division, intracellular trafficking, biogenesis of organelles, cell adhesion and motility.

**GDCB 533: Advances in Developmental Biology**

(Cross-listed with MCDB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* BIOL 314 or Biol 423

Fundamental principles in multicellular development. Emphasis on cellular and molecular regulation of developmental processes, and experimental approaches as illustrated in the current literature.

**GDCB 536: Statistical Genetics**

(Cross-listed with STAT). (3-0) Cr. 3.

*Prereq:* STAT 401 or STAT 587; STAT 447 or STAT 588; GEN 320 or BIOL 313

Statistical models and methods for genetics covering models of population processes: selection, mutation, migration, population structure, and linkage disequilibrium, and inference techniques: genetic mapping, linkage analysis, and quantitative trait analysis. Applications include genetic map construction, gene mapping, genome-wide association studies (GWAS), inference about population structure, phylogenetic tree construction, and forensic and paternity identification.

**GDCB 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**GDCB 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**GDCB 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**GDCB 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**GDCB 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**GDCB 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**GDCB 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**GDCB 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, HORT, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**GDCB 544: Fundamentals of Bioinformatics**

(Cross-listed with BCB, COM S, CPR E). (4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq:* MATH 165 or STAT 401 or equivalent

A practical, hands-on overview of how to apply bioinformatics to biological research. Recommended for biologists desiring to gain computational molecular biology skills. Topics include: sequence analysis, genomics, proteomics, phylogenetic analyses, ontology enrichment, systems biology, data visualization and emergent technologies.

**GDCB 545: Plant Molecular, Cell and Developmental Biology**

(Cross-listed with MCDB, PLBIO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Biol 313, BIOL 314, BIOL 330 or BBMB 405

Plant nuclear and organelle genomes; regulation of gene expression; hormone signaling; organization, function, and development of plant cells and subcellular structures; regulation of plant growth and development.

**GDCB 556: Cellular, Molecular and Developmental Neuroscience**

(Cross-listed with B M S, NEURO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BIOL 335 or BIOL 436; physics recommended*

Fundamental principles of neuroscience including cellular and molecular neuroscience, nervous system development, and regulatory systems.

**GDCB 557: Rotations in Neuroscience**

(Cross-listed with NEURO). (2-0) Cr. 2. F.S.

Rotation experiences in various neuroscience research methods and techniques related to our current faculty specialties.

**GDCB 568: Statistical Bioinformatics**

(Cross-listed with BCB, COM S, STAT). (3-0) Cr. 3. S.

*Prereq: BCB 567 or (BIOL 315 and one of STAT 430 or STAT 483 or STAT 583), credit or enrollment in GEN 409*

Statistical models for sequence data, including applications in genome annotation, motif discovery, variant discovery, molecular phylogeny, gene expression analysis, and metagenomics. Statistical topics include model building, inference, hypothesis testing, and simple experimental design, including for big data/complex models.

**GDCB 569: Structural Bioinformatics**

(Cross-listed with BBMB, BCB, COM S, CPR E). (3-0) Cr. 3. F.

*Prereq: BCB 567, BBMB 316, GEN 409, STAT 430*

Molecular structures including genes and gene products: protein, DNA and RNA structure. Structure determination methods, structural refinement, structure representation, comparison of structures, visualization, and modeling. Molecular and cellular structure from imaging. Analysis and prediction of protein secondary, tertiary, and higher order structure, disorder, protein-protein and protein-nucleic acid interactions, protein localization and function, bridging between molecular and cellular structures. Molecular evolution.

**GDCB 570: Systems Biology**

(Cross-listed with BCB, COM S, CPR E, STAT). (3-0) Cr. 3. S.

*Prereq: BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430 or STAT 483 or STAT 583*

Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

**GDCB 585: Fundamentals of Predictive Plant Phenomics**

(Cross-listed with BCB, M E). Cr. 4. F.

Principles of engineering, data analysis, and plant sciences and their interplay applied to predictive plant phenomics. Transport phenomena, sensor design, image analysis, graph models, network data analysis, fundamentals of genomics and phenomics. Multidisciplinary laboratory exercises.

**GDCB 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**Courses for graduate students:****GDCB 661: Advanced Topics in Neuroscience**

(Cross-listed with BBMB, KIN, NEURO). (3-0) Cr. 3. Repeatable. Alt. S., offered even-numbered years.

*Prereq: NEURO 556 (or comparable course) or permission of instructor*

Students will present three journal articles and two overview lectures on topics in neuroscience that are related but outside of their own research interest.

**GDCB 690: Seminar in GDCB**

Cr. 1. Repeatable.

Research seminars by faculty, invited speakers, and graduate students. Offered on a satisfactory-fail basis only.

**GDCB 696: Research Seminar**

(Cross-listed with AGRON, BBMB, FOR, HORT, PLBIO). Cr. 1. Repeatable.

Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**GDCB 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, MCDB, MICRO, V MPM). (2-0) Cr. 1-2.

Repeatable. S.

Student and faculty presentations.

**GDCB 699: Research**

Cr. arr. Repeatable.

Research for thesis or dissertation. Offered on a satisfactory-fail basis only.

## Geology (GEOL)

***Any experimental courses offered by GEOL can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**



**GEOL 100: How the Earth Works**

(3-0) Cr. 3. F.S.SS.

How does the earth work, what is it made of, and how does it change through time? Plate tectonics, Earth materials, landforms, structures, climate, and natural resources. Emphasis on the observations and hypotheses used to interpret earth system processes. Students may also enroll in Geol 100L.

**GEOL 100L: How the Earth Works: Laboratory**

(0-2) Cr. 1. F.S.

*Prereq: GEOL 100*

Students will gain understanding of how Earth processes affect their lives and how they affect the Earth, and of the complex nature of the Earth and its processes. They will gain a deep knowledge of the methods used to understand the time scales and rates of Earth processes also through an applied research experience on groundwater and surface water.

**GEOL 101: Environmental Geology: Earth in Crisis**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.SS.

Exploration of the interactions between humans and the geologic environment, and the consequences of those interactions, on local to global scales. Discussion of water, soil, mineral, and energy resources, pollution, climate change, and natural hazards such as earthquakes, volcanism, mass wasting, and flooding.

**GEOL 102: History of the Earth**

(3-0) Cr. 3. S.

*Prereq: GEOL 100 or GEOL 201*

Tectonic, climate, and biological evolution of the Earth. Interactions between the three are emphasized. Methods used to decipher earth history. Students majoring in geology must also enroll in Geol 102L.

**GEOL 102L: History of the Earth: Laboratory**

(0-2) Cr. 1. S.

*Prereq: GEOL 102*

Introduction to the use of sedimentary rocks and fossils in reconstructing the Earth's history.

**GEOL 103: Age of Dinosaurs**

Cr. 1. F.

Introduction to the diversity of dinosaur species. Discussion of basic evolutionary theory and interpretation of fossil evidence. Overview of Mesozoic Earth history including paleogeographic and paleoclimate reconstructions. Course available via the World Wide Web.

**GEOL 105: Gems and Gemstones**

(2-0) Cr. 1. F.

Offered in second half of the semester. Introduction to gems and gemstones, physical and optical properties of gems and gemstones, explanation of where gems come from and how they are found, how to distinguish between synthetic and naturally occurring gems, how the value of gems are determined, and the history of famous gems.

**GEOL 108: Introduction to Oceanography**

(Cross-listed with ENV S). (3-0) Cr. 3. F.

Introduction to the study of oceans and the processes that helped shape them. A major focus is on how the oceans work, with special attention on geological, chemical, and biological processes. Ocean circulation and its influence on climate. Life of the oceans. Use and misuse of ocean resources. Anthropogenic impacts on the oceanic environment.

**GEOL 111: Geological Disasters**

(Cross-listed with ENV S). (1-0) Cr. 1. F.S.SS.

Introduction to the catastrophic geologic processes with the potential to devastate human populations that continue to expand into regions at greatest risk from geologic hazards. Selected case studies and discussion of plate tectonics, climate, and earth processes explain the driving forces behind natural hazards such as earthquakes, tsunamis, volcanic eruptions, landslides, and floods.

**GEOL 112: Geoscience Orientation**

(Cross-listed with MTEOR). (1-0) Cr. 1. F.

Orientation course for students enrolled in the Earth, Wind and Fire Learning Community. Provides an introduction to Iowa State University and meteorology, geology, and Earth science programs for students enrolled in the department's learning community. Activities include academic and social activities, talks and presentations on academic success, resume writing, and study abroad, as well as research talks by faculty members.

**GEOL 113: Spring Geoscience Orientation for Earth, Wind and Fire Learning Community**

(Cross-listed with MTEOR). (1-0) Cr. 1. S.

Spring orientation course for students enrolled in the "Earth, Wind and Fire" Learning Community. Develop and apply quantitative, data-analysis, management, and communication skills on an authentic research project in a team to focus on professionalism and resilience. Introduction to interview strategies and the importance of creating a professional image on social media. Academic and social events, plus two field trips.

**GEOL 140: Climate and Society**

(Cross-listed with AGRON, ENV S, MTEOR). Cr. 3. F.S.

The climate system of our planet. How nature and our actions alter the existing energy balance leading to climate change. Past climates on our planet. The influence of climate on society and resource availability during the Holocene (~ 11,000 years ago to present) with focus on changes post industrial revolution. Significant climate events that have altered our way of life in the past. Projected changes in future climate and potential impacts on society, environment and resources. Adaption to and mitigation of climate change.

Meets International Perspectives Requirement.

**GEOL 160: Water Resources of the World**

(Cross-listed with AGRON, ENV S, MTEOR). (3-0) Cr. 3. S.

Study of the occurrence, history, development, and management of world water resources. Basic hydrologic principles including climate, surface water, groundwater, and water quality. Historical and current perspectives on water policy, use, and the role of water in society and the environment. Meets International Perspectives Requirement.

**GEOL 201: Geology for Engineers and Environmental Scientists**

(2-2) Cr. 3. F.

Introduction to Earth materials and processes with emphasis on engineering and environmental applications.

**GEOL 290: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Independent study for freshman and sophomore students.

**GEOL 298: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: GEOL 100; GEOL 100L; GEOL 102; GEOL 102L; GEOL 201; Sophomore classification*

Required of all cooperative education students. Students must register for this course prior to commencing the work period.

**GEOL 302: Summer Field Studies**

Cr. 6. SS.

*Prereq: GEOL 102; GEOL 356; GEOL 368*

Geologic mapping; structural, stratigraphic, sedimentologic, metamorphic, geomorphic, and environmental analyses. Study areas in the Bighorn Basin and Wind River Range and excursions to Yellowstone and Grand Teton National Parks. A 6-week summer field course required of all geology majors.

**GEOL 315: Mineralogy and Earth Materials**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in CHEM 163 or CHEM 167 or CHEM 177*

Introduction to mineral classification, elementary crystal chemistry, crystal growth and morphology, mineral stability, and mineral associations. GEOL 100 or GEOL 101 or GEOL 201 or equivalent recommended.

**GEOL 315L: Laboratory in Mineralogy and Earth Materials**

(0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in CHEM 163 or CHEM 167 or CHEM 177*

Mineral identification methods, especially hand-specimen identification. GEOL 100 or GEOL 101 or GEOL 201 or equivalent recommended.

**GEOL 316: Optical Mineralogy**

(1-2) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in CHEM 163 or CHEM 167 or CHEM 177*

Laboratory problems in mineral-identification methods utilizing optical microscopic techniques. GEOL 100 or GEOL 101 or GEOL 201 or equivalent recommended.

**GEOL 324: Energy and the Environment**

(Cross-listed with ENSCI, ENV S, MTEOR). (3-0) Cr. 3. S.

*Prereq: CHEM 163 or CHEM 167 or CHEM 177*

Exploration of the origin of Earth's energy resources and the environmental and climatic impacts of energy acquisition and consumption. Renewable and non-renewable energy resources within an Earth-system context. Various environmentally-relevant topics such as water quality and availability, habitat destruction, greenhouse-gas emissions, and health and safety hazards to wildlife and human communities.

**GEOL 356: Structural Geology and Tectonics**

(3-3) Cr. 4. S.

*Prereq: (GEOL 100 or GEOL 201); PHYS 131; PHYS 131L*

Principles of stress, strain, and rheology. Brittle and ductile behavior of rocks. Mechanics of formation, description, and classification of fractures, faults, folds, foliation, and lineation. From micro-structures to tectonic processes. Laboratory includes application of learned concepts to real-world scenarios, geometrical techniques to solve structural problems.

**GEOL 357: Geological Mapping and Field Methods**

Cr. 1. F.

*Prereq: (GEOL 100 or GEOL 201); PHYS 131; PHYS 131L*

Generation and interpretation of geological maps via a combination of laboratory and field exercises. Developing skills in 3D thinking, cross-section construction, stereonet analysis, field data collection, and communicating scientific results.

**GEOL 365: Igneous and Metamorphic Petrology**

(2-3) Cr. 3. S.

*Prereq: GEOL 315; GEOL 315L; GEOL 316*

Nature and origin of igneous and metamorphic rocks. Emphasis on important rock-forming environments and processes and their influence on rock characteristics. Laboratory includes thin section study of rock textures and mineralogy and the interpretation of these features.

**GEOL 368: Sedimentary Geology**

(3-3) Cr. 4. F.

*Prereq: GEOL 102*

Exploration of the interplay between weathering, sedimentation, sea-level change, tectonics, and life through time that creates sedimentary rocks and stratigraphic packages. Understanding of the historical development of sedimentary geology through the development of petrography, paleontology, deep earth sampling, geophysical technologies, and geochemistry. Field and laboratory problem sets illuminate lecture material.

**GEOL 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: GEOL 100; GEOL 100L; GEOL 102; GEOL 102L; GEOL 201; Junior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**GEOL 402: Watershed Hydrology**

(Dual-listed with GEOL 502). (Cross-listed with ENSCI, MTEOR, NREM).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**GEOL 406: Geology Field Course**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: GEOL 100 or GEOL 201*

Weekly seminar introduces students to a selected geological region or theme that is visited on a required ten-day field excursion. Introduction to field-safety leadership.

**GEOL 409: Field Methods in Hydrogeology**

(Dual-listed with GEOL 509). (Cross-listed with ENSCI). (0-4) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: GEOL 402 or ENSCI 402 or GEOL 411 or ENSCI 411 or C E 473*

Introduction to field methods used in groundwater investigations. In-field implementation of pumping tests, slug tests, monitoring well installation and drilling techniques, geochemical and water quality sampling, seepage meters, minipiezometers, stream gaging, and electronic instrumentation for data collection. Field trips to investigate water resource, water quality, and remediation projects.

**GEOL 411: Hydrogeology**

(Dual-listed with GEOL 511). (Cross-listed with ENSCI). (3-2) Cr. 4. F.

Physical principles of groundwater flow, nature and origin of aquifers and confining units, well hydraulics, groundwater modeling, and contaminant transport. Lab emphasizes applied field and laboratory methods for hydrogeological investigations.

**GEOL 412: Micropaleontology**

(Dual-listed with GEOL 512). (Cross-listed with ENSCI). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: GEOL 102; GEOL 102L*

Evolution, identification and utility of major microfossil groups from the Mesozoic to present. Focus on Cenozoic applications including biostratigraphy, paleoclimate, and paleothermometry using assemblages, stable isotopes, Mg/Ca, and molecular fossils. Laboratory includes processing and analysis of specific microfossils. Major groups covered include foraminifera, calcareous nannofossils, sponge spicules, diatoms, radiolarians, and silicoflagellates.

**GEOL 413: Applied and Environmental Geophysics**

(Dual-listed with GEOL 513). (Cross-listed with C E, ENSCI). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**GEOL 414: Applied Groundwater Flow Modeling**

(Dual-listed with GEOL 514). (Cross-listed with ENSCI). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* (C E 473 or GEOL 411); MATH 165

Introduction to the principles of modeling groundwater flow systems. Finite-difference and analytic-element methods, spreadsheet models, boundary conditions, calibration, sensitivity analysis, parameter estimation, particle tracking, and post-audit analysis. Application of MODFLOW to regional flow-system analysis. Computer laboratory emphasizes assigned problems that illustrate topics discussed in the course.

**GEOL 415: Paleoclimatology**

(Dual-listed with GEOL 515). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to mechanisms that drive climate, including the interplay between oceanic and atmospheric circulation and fluctuation in Earth's orbital parameters. Examination and analysis of past climate records ranging from historical documentation to ecological and geochemical proxies (e.g. tree ring analysis; O and C isotopes of skeletal carbonates and soils). Dating methods used to constrain and correlate climatic periods; utility of computer models to reconstruct past climates and predict future climate change. Emphasis placed on paleoclimatology and paleoecology of the late Quaternary (last ~1 million years).

**GEOL 416: Hydrologic Modeling and Analysis**

(Dual-listed with GEOL 516). (Cross-listed with ENSCI, MTEOR). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

Study of the basic principles of hydrologic modeling, including rainfall-runoff analysis, lumped and distributed modeling, conceptual and physical models, parameter estimation and sensitivity analysis, input and validation data, uncertainty analysis, and the use of models in surface water hydrology. A range of common models are applied to study hydrologic topics such as flood forecasting and land use change impacts. Previous experience with Matlab or other programming language is needed.

**GEOL 419: Aqueous and Environmental Geochemistry**

(Dual-listed with GEOL 519). (Cross-listed with ENSCI). (2-2) Cr. 3. S.

*Prereq:* CHEM 178; CHEM 178L; Junior classification

Geochemistry of natural waters and water-rock interactions. Acid-base equilibria, carbonate chemistry and buffer systems, mineral dissolution and precipitation, sorption, ion exchange, and redox reactions. Introduction to thermodynamics and kinetics. Laboratory emphasizes chemical analysis of waters and computer modeling.

**GEOL 420: Mineral Resources**

(Dual-listed with GEOL 520). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* GEOL 365

Geology and geochemistry of non-metallic and metallic ore deposits. Major processes that concentrate metals in the Earth. Geochemical conditions of ore formation using stable-isotope and fluid-inclusion studies. Laboratory emphasizes the study of metallic ores.

**GEOL 426: Stable Isotopes in the Environment**

(Dual-listed with GEOL 526). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to the theory, methods and applications of stable isotopes. Primary focus on the origin, natural abundance, and fractionation of carbon, hydrogen, oxygen, nitrogen isotopes. Applications of isotopic occurrence for elucidation of physical, chemical, biological, and environmental processes. Effects of plant physiology, photosynthesis, trophic structure, diffusion, evaporation, chemical precipitation, soil and atmospheric processes, and environmental factors on isotope abundance.

**GEOL 439: Seismic Methods in Geology, Engineering, and Petroleum Exploration**

(Dual-listed with GEOL 539). (Cross-listed with C E). (2-2) Cr. 3. Alt. S., offered even-numbered years.

Physics of elastic-wave propagation. Seismic surveys in environmental imaging, engineering, and petroleum exploration. Reflection and refraction techniques. Data collection, processing, and geological interpretation. Field work with state-of-the-art equipment. Introductory geology, algebra, and trigonometry recommended.

**GEOL 444: Petroleum Geoscience and Engineering**

(Dual-listed with GEOL 544). (2-2) Cr. 3. Alt. S., offered even-numbered years.

The geoscience and engineering aspects of exploration, development, and production of hydrocarbon resources around the world, as well as the historical and legal frameworks through which the industry has developed. Broader discussions of safety, risk, uncertainty, cost, and integrity as relevant to the petroleum industry.

**GEOL 452: Intro GIS for Geoscientists**

(Dual-listed with GEOL 552). (Cross-listed with AGRON, ENSCI). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**GEOL 468: Applied Geostatistics for Geoscientists**

(Dual-listed with GEOL 568). (Cross-listed with ENSCI, MTEOR). Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

**GEOL 474: Glacial and Quaternary Geology**

(Dual-listed with GEOL 574). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* GEOL 100 or GEOL 201

The study of glaciers and glacial processes. Discussion of glaciology, glacial sediment transport, glacial landforms, and Quaternary history. Laboratory emphasizes topographic map interpretation and the Quaternary landscapes of Iowa.

**GEOL 479: Surficial Processes**

(Dual-listed with GEOL 579). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

The study of physical processes that shape Earth's surface. Topics include weathering, sediment transport, and landform genesis with emphasis on fluvial, glacial, hillslope, eolian, and coastal processes. Applications to engineering and environmental problems. Laboratory includes topographic map interpretation and local field trips.

**GEOL 483: Environmental Biogeochemistry**

(Cross-listed with BIOL, ENSCI). Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* 12 credits in BIOL, CHEM, PHYS

An exploration of biological, physical and geochemical impacts on the structure and function of ecosystems from local to global scales. Emphasis on the cycles of carbon, nitrogen, phosphorus, sulfur, and metals, and how these have been impacted by human activity. Topics may include biological feedbacks to climate change, microbial physiology and redox reactions, plant/soil feedbacks, terrestrial/aquatic linkages, early Earth processes and the origins of life.

**GEOL 487: Microbial Ecology**

(Dual-listed with GEOL 587). (Cross-listed with BIOL, ENSCI, MICRO). (3-0) Cr. 3. F.

*Prereq:* Six credits in biology and 6 credits in chemistry

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**GEOL 488: Raster GIS for Geoscientists**

(Dual-listed with GEOL 588). (Cross-listed with AGRON, ENSCI). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**GEOL 489: Survey of Remote Sensing Technologies**

(Dual-listed with GEOL 589). (Cross-listed with E E, ENSCI, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**GEOL 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with GEOL 589L). (Cross-listed with E E, MTEOR, NREM). (0-3) Cr. 1. F.

*Prereq:* 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**GEOL 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq:* 6 credits in GEOL; Permission of Instructor

Independent study for senior students. No more than 9 credits of Geol 490 may be counted toward graduation.

**GEOL 495: Undergraduate Seminar**

Cr. 1. F.S.

*Prereq:* Junior or Senior classification

Weekly seminar on topics of current research interest. Requires written summaries of three presentations of choice.

**GEOL 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq:* (GEOL 100 or GEOL 201); GEOL 100L; GEOL 102; GEOL 102L; Permission of Department Cooperative Education Coordinator; Senior classification

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**GEOL 502: Watershed Hydrology**

(Dual-listed with GEOL 402). (Cross-listed with ENSCI, MTEOR, NREM).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**GEOL 506: Geology Field Course**

Cr. 1-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Graduate classification*

Weekly seminar introduces students to a selected geological region or theme that is visited on a required ten-day field excursion. Graduate students are expected to assist in field teaching and safety leadership.

**GEOL 507: Midwestern Geology Field Trip**

Cr. 1. Repeatable, maximum of 4 times. F.

*Prereq: GEOL 365*

On-site inspection of various ore deposits, mining operations, and terrains dominated by igneous or metamorphic rocks. Offered on a satisfactory-fail basis only.

**GEOL 509: Field Methods in Hydrogeology**

(Dual-listed with GEOL 409). (Cross-listed with ENSCI). (0-4) Cr. 3. Alt. SS., offered even-numbered years.

*Prereq: GEOL 402 or ENSCI 402 or GEOL 411 or ENSCI 411 or C E 473*

Introduction to field methods used in groundwater investigations. In-field implementation of pumping tests, slug tests, monitoring well installation and drilling techniques, geochemical and water quality sampling, seepage meters, minipiezometers, stream gaging, and electronic instrumentation for data collection. Field trips to investigate water resource, water quality, and remediation projects.

**GEOL 511: Hydrogeology**

(Dual-listed with GEOL 411). (Cross-listed with ENSCI). (3-2) Cr. 4. F.

Physical principles of groundwater flow, nature and origin of aquifers and confining units, well hydraulics, groundwater modeling, and contaminant transport. Lab emphasizes applied field and laboratory methods for hydrogeological investigations.

**GEOL 512: Micropaleontology**

(Dual-listed with GEOL 412). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: GEOL 102; GEOL 102L*

Evolution, identification and utility of major microfossil groups from the Mesozoic to present. Focus on Cenozoic applications including biostratigraphy, paleoclimate, and paleothermometry using assemblages, stable isotopes, Mg/Ca, and molecular fossils. Laboratory includes processing and analysis of specific microfossils. Major groups covered include foraminifera, calcareous nannofossils, sponge spicules, diatoms, radiolarians, and silicoflagellates.

**GEOL 513: Applied and Environmental Geophysics**

(Dual-listed with GEOL 413). (Cross-listed with C E, ENSCI). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

Seismic, gravity, magnetic, resistivity, electromagnetic, and ground-penetrating radar techniques for shallow subsurface investigations and imaging. Data interpretation methods. Lab emphasizes computer interpretation packages. Field work with seismic - and resistivity-imaging systems and radar. Introductory geology, algebra, and trigonometry recommended.

**GEOL 514: Applied Groundwater Flow Modeling**

(Dual-listed with GEOL 414). (Cross-listed with ENSCI). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: (C E 473 or GEOL 411); MATH 165*

Introduction to the principles of modeling groundwater flow systems. Finite-difference and analytic-element methods, spreadsheet models, boundary conditions, calibration, sensitivity analysis, parameter estimation, particle tracking, and post-audit analysis. Application of MODFLOW to regional flow-system analysis. Computer laboratory emphasizes assigned problems that illustrate topics discussed in the course.

**GEOL 515: Paleoclimatology**

(Dual-listed with GEOL 415). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Introduction to mechanisms that drive climate, including the interplay between oceanic and atmospheric circulation and fluctuation in Earth's orbital parameters. Examination and analysis of past climate records ranging from historical documentation to ecological and geochemical proxies (e.g. tree ring analysis; O and C isotopes of skeletal carbonates and soils). Dating methods used to constrain and correlate climatic periods; utility of computer models to reconstruct past climates and predict future climate change. Emphasis placed on paleoclimatology and paleoecology of the late Quaternary (last ~1 million years).



**GEOL 519: Aqueous and Environmental Geochemistry**

(Dual-listed with GEOL 419). (Cross-listed with ENSCI). (2-2) Cr. 3. S.

*Prereq: CHEM 178; CHEM 178L; Junior classification*

Geochemistry of natural waters and water-rock interactions. Acid-base equilibria, carbonate chemistry and buffer systems, mineral dissolution and precipitation, sorption, ion exchange, and redox reactions. Introduction to thermodynamics and kinetics. Laboratory emphasizes chemical analysis of waters and computer modeling.

**GEOL 520: Mineral Resources**

(Dual-listed with GEOL 420). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: GEOL 365*

Geology and geochemistry of non-metallic and metallic ore deposits. Major processes that concentrate metals in the Earth. Geochemical conditions of ore formation using stable-isotope and fluid-inclusion studies. Laboratory emphasizes the study of metallic ores.

**GEOL 526: Stable Isotopes in the Environment**

(Dual-listed with GEOL 426). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

Introduction to the theory, methods and applications of stable isotopes. Primary focus on the origin, natural abundance, and fractionation of carbon, hydrogen, oxygen, nitrogen isotopes. Applications of isotopic occurrence for elucidation of physical, chemical, biological, and environmental processes. Effects of plant physiology, photosynthesis, trophic structure, diffusion, evaporation, chemical precipitation, soil and atmospheric processes, and environmental factors on isotope abundance.

**GEOL 539: Seismic Methods in Geology, Engineering, and Petroleum Exploration**

(Dual-listed with GEOL 439). (Cross-listed with C E). (2-2) Cr. 3. Alt. S., offered even-numbered years.

Physics of elastic-wave propagation. Seismic surveys in environmental imaging, engineering, and petroleum exploration. Reflection and refraction techniques. Data collection, processing, and geological interpretation. Field work with state-of-the-art equipment. Introductory geology, algebra, and trigonometry recommended.

**GEOL 544: Petroleum Geoscience and Engineering**

(Dual-listed with GEOL 444). (2-2) Cr. 3. Alt. S., offered even-numbered years.

The geoscience and engineering aspects of exploration, development, and production of hydrocarbon resources around the world, as well as the historical and legal frameworks through which the industry has developed. Broader discussions of safety, risk, uncertainty, cost, and integrity as relevant to the petroleum industry.

**GEOL 552: Intro GIS for Geoscientists**

(Dual-listed with GEOL 452). (Cross-listed with AGRON, ENSCI). (2-2) Cr. 3. F.S.

Introduction to geographic information systems (GIS) using ArcGIS Pro with particular emphasis on geoscientific data. Teaches typical GIS operations and analyses in the geosciences to prepare students for practical use of GIS in industry and academia. Includes a class project for GEOL 552. Sophomore classification or above recommended.

**GEOL 555: Environmental Soil Mineralogy**

(Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AGRON 473, CHEM 178. Recommend: GEOL 311*

Structure and behavior of clay minerals, humic substances and biochar in soil environments, with emphasis on reactions and environmental implications.

**GEOL 559: Quantitative Methods in Geology**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Math 166, Phys 112, GEOL 356, or by permission of instructor*

Analysis of geologic data on applied and quantitative basis using MATLAB. Introduction to basic programming with special focus to applied geoscience problems such as stress and strain analysis, particle tracking for fracture propagation and strain field visualization, basic tectonic modeling, red noise filtering. Toolkit development for effective handling of large data sets and picture analysis.

**GEOL 568: Applied Geostatistics for Geoscientists**

(Dual-listed with GEOL 468). (Cross-listed with ENSCI, MTEOR). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)*

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

**GEOL 574: Glacial and Quaternary Geology**

(Dual-listed with GEOL 474). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: GEOL 100 or GEOL 201*

The study of glaciers and glacial processes. Discussion of glaciology, glacial sediment transport, glacial landforms, and Quaternary history. Laboratory emphasizes topographic map interpretation and the Quaternary landscapes of Iowa.

**GEOL 579: Surficial Processes**

(Dual-listed with GEOL 479). (Cross-listed with ENSCI). (2-3) Cr. 3. F.  
The study of physical processes that shape Earth's surface. Topics include weathering, sediment transport, and landform genesis with emphasis on fluvial, glacial, hillslope, eolian, and coastal processes. Applications to engineering and environmental problems. Laboratory includes topographic map interpretation and local field trips.

**GEOL 587: Microbial Ecology**

(Dual-listed with GEOL 487). (Cross-listed with EEOB, ENSCI, MICRO). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**GEOL 588: Raster GIS for Geoscientists**

(Dual-listed with GEOL 488). (Cross-listed with AGRON, ENSCI). (2-2) Cr. 3. Alt. S., offered odd-numbered years.

GIS course with focus on the spatial analysis and modeling of raster and triangulated irregular network (TIN) data using ArcGIS Pro. Includes practical exercises during lectures, lab exercises, homework assignments, and (for GEOL 588) a class project. Basic knowledge of ArcGIS Pro is a plus but not required. Course can be taken concurrently to any other Intro GIS course. Sophomore classification or above recommended.

**GEOL 589: Survey of Remote Sensing Technologies**

(Dual-listed with GEOL 489). (Cross-listed with E E, ENSCI, MTEOR, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**GEOL 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with GEOL 489L). (Cross-listed with E E, MTEOR, NREM). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**GEOL 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590A: Special Topics: Surficial Processes**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590B: Special Topics: Stratigraphy**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590C: Special Topics: Sedimentation**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590D: Special Topics: Paleontology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590E: Special Topics: Petrology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590F: Special Topics: Structural Geology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590G: Special Topics: Geochemistry**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590H: Special Topics: Hydrogeology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590I: Special Topics: Earth Science**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590J: Special Topics: Mineral Resources**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590K: Special Topics: Geophysics**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590L: Special Topics: Mineralogy**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590M: Special Topics: Tectonics**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590N: Special Topics: Paleoecology and Paleoclimatology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 5900: Special Topics: Isotope Geochemistry**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590P: Special Topics: Computational Methods and GIS**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590R: Special Topics: Surface Hydrology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 590S: Special Topics: Oceanography**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**GEOL 595: Graduate Seminar**

(Cross-listed with MTEOR). Cr. 1. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**GEOL 595A: Graduate Seminar: Presentation Required**

(Cross-listed with MTEOR). (1-0) Cr. 1. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**GEOL 595B: Graduate Seminar: Attendance Only**

(Cross-listed with MTEOR). Cr. R. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Attendance only. Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**GEOL 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**GEOL 610: Advanced Seminar**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610A: Advanced Seminar: Earth Materials**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610B: Advanced Seminar: Economic Geology**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610C: Advanced Seminar: Environmental Geochemistry**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610D: Advanced Seminar: Geophysics**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610E: Advanced Seminar: Geotectonics**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610F: Advanced Seminar: Hydrogeology**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610G: Advanced Seminar: Surficial Processes**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610H: Advanced Seminar: Sedimentation and Stratigraphy**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610I: Advanced Seminar: Paleoecology and Paleoclimatology**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610J: Advanced Seminar: Isotope Geochemistry**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 610K: Advanced Seminar: Computational Methods and GIS**

Cr. 1-3. Repeatable. F.S.

*Prereq: Graduate standing and permission of instructor*

**GEOL 699: Research**

Cr. arr. Repeatable.

**GEOL 699A: Research: Surficial Processes**

Cr. arr. Repeatable.

**GEOL 699B: Research: Stratigraphy**

Cr. arr. Repeatable.

**GEOL 699C: Research: Sedimentation**

Cr. arr. Repeatable.

**GEOL 699D: Research: Paleontology**

Cr. arr. Repeatable.

**GEOL 699E: Research: Petrology**

Cr. arr. Repeatable.

**GEOL 699F: Research: Structural Geology**

Cr. arr. Repeatable.

**GEOL 699G: Research: Geochemistry**

Cr. arr. Repeatable.

**GEOL 699H: Research: Hydrogeology**

Cr. arr. Repeatable.

**GEOL 699I: Research: Earth Science**

Cr. arr. Repeatable.

**GEOL 699J: Research: Mineral Resources**

Cr. arr. Repeatable.

**GEOL 699K: Research: Geophysics**

Cr. arr. Repeatable.

**GEOL 699L: Research: Mineralogy**

Cr. arr. Repeatable.

**GEOL 699M: Research: Tectonics**

Cr. arr. Repeatable.

**GEOL 699N: Research: Paleoecology and Paleoclimatology**

Cr. arr. Repeatable.

**GEOL 699O: Research: Isotope Geochemistry**

Cr. arr. Repeatable.

**GEOL 699P: Research: Computational Methods and GIS**

Cr. arr. Repeatable.

**GEOL 699R: Research: Surface Hydrology**

Cr. arr. Repeatable.

**GEOL 699S: Research: Geoscience Education**

Cr. arr. Repeatable.

## German (GER)

*Any experimental courses offered by GER can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**GER 101: Elementary German I**

(4-0) Cr. 4. F.SS.

Beginning level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. For beginning-level learners who have little or no prior exposure to German.

**GER 102: Elementary German II**

(4-0) Cr. 4. S.SS.

*Prereq: GER 101*

Beginning level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. For beginning level learners with only one semester of German (or exposure equivalent to two years or less in high school.).

Meets International Perspectives Requirement.

**GER 201: Intermediate German I**

(4-0) Cr. 4. F.

*Prereq: GER 102*

Intermediate level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. Intensive review of basic grammar covered in the first-year German class (or equivalent high school courses) while exploring cultural topics and themes.

Meets International Perspectives Requirement.

**GER 202: Intermediate German II**

(4-0) Cr. 4. S.

*Prereq: GER 201*

Intermediate level development of reading, writing, listening comprehension, and speaking in German within the context of German culture. Emphasis on intermediate level grammar and communication about topics and themes beyond the personal realm.

Meets International Perspectives Requirement.

**GER 301: Reading**

(3-0) Cr. 3. F.

*Prereq: GER 202*

Emphasis on reading with further development of grammar using a variety of texts.

Meets International Perspectives Requirement.

**GER 302: Composition**

(3-0) Cr. 3. S.

*Prereq: GER 202*

Emphasis on writing skills, with further development of grammar and reading skills using a variety of current and historical materials.

Meets International Perspectives Requirement.

**GER 304: German for Global Professionals**

(3-0) Cr. 3. F.

*Prereq: GER 202*

Communication in business and professional contexts in German-speaking countries. Development of effective communication strategies and project management in the workplace. Cultural contexts of business and professional practice. Preparation for internships.

Meets International Perspectives Requirement.

**GER 305: Conversation**

(3-0) Cr. 3. S.

*Prereq: GER 202*

Intensive conversational and listening practice in German. GER 301 recommended.

Meets International Perspectives Requirement.

**GER 320: Germany Today**

(3-0) Cr. 3. S.

*Prereq: GER 301 or GER 304*

Selected topics dealing with contemporary German society and culture.

Introduction to materials, resources, and forms of communication available on the Internet, and in other electronic and print media.

Meets International Perspectives Requirement.

**GER 330: German Literature and Culture**

(3-0) Cr. 3. Repeatable. F.

*Prereq: GER 301 or Permission of Instructor*

Selected readings in German literature from Classicism to present.

Emphasis on techniques of reading and analysis of literary texts. No more than six credits of Ger 330 may be counted toward the major.

Meets International Perspectives Requirement.

**GER 370: German Studies in English**

(3-0) Cr. 3-4. Repeatable, maximum of 6 credits.

*Prereq: Sophomore classification*

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Three credits: English, open to all students. Four credits: Required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 370G: Studies in English Translation: German Topics on Women or Feminism**

(Cross-listed with WGS). (3-0) Cr. 3-4. Repeatable, maximum of 6 credits.

*Prereq: Sophomore classification*

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Three credits: English, open to all students. Four credits: Required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 371: The Holocaust in Text, Image, and Memory**

(3-0) Cr. 3-4.

*Prereq: Sophomore classification*

Examination of such topics as the origins and expressions of Anti-Semitism in central Europe, the political events and structures of the Holocaust, the reality of ghettos and concentration camps, the impact of technological modernization on the Final Solution, and resistance to the Nazis. Materials will include non-fictional texts, literature, art, and music. Three credits: English, open to all students. Four credits: required for German major credit, supplementary readings and compositions in German. Four credits: required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 375: Grimms' Tales**

(3-0) Cr. 3-4.

*Prereq: Sophomore classification*

Emphasis on the Grimm tales: theoretical approaches to the tales from the late 19th and early 20th centuries; perversions of these traditional tales by the National Socialists (Nazis). Readings in contemporary Grimm scholarship. Taught in English. Three credits: English, open to all students. Four credits: required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 378: German Film and Media Studies**

(3-0) Cr. 3-4. S.

*Prereq: Sophomore classification*

Analysis and interpretation of film or media in German society. Study of media production and reception within multicultural and global contexts. Thematic emphases based on faculty and student interest including: 1) film directors, genres, movements (e.g. New German Cinema), aesthetics, and cinematography or 2) media studies (e.g. television, mass press, popular culture). Three credits: English, open to all students. Four credits: required for German concentration credit, supplementary readings and compositions in German. Counts towards the World Film Studies Minor. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 395: Study Abroad**

Cr. 1-10.

*Prereq: 12 credits in GER; Department Permission*

Supervised instruction in language and culture of Germany; formal class instruction at level appropriate to student's training, augmented by practical living experience.

Meets International Perspectives Requirement.

**GER 476: Topics in German Cultural Studies**

(3-0) Cr. 3-4. S.

*Prereq: Sophomore classification*

Key topics and themes in German history and culture up to the modern era. Three credits: Taught in English, open to all students. Four credits: Required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, six credits in GER at the 300-level.

Meets International Perspectives Requirement.

**GER 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in GER; Permission of Department Chair*

Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 9 credits of Ger 490 may be counted toward graduation.

**GER 499: Internship in German**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in GER at the 300-level; Permission of Advisor; Permission of World Languages and Cultures Internship Coordinator*

Work experience using German language skills in the public or private sector, combined with academic work under faculty supervision.

Available only to majors and minors. Offered on a satisfactory-fail basis only. Ger 499 may be repeated to a maximum of 6 credits. No more than 3 credits of Ger 499 may be applied to the major.

**Courses primarily for graduate students, open to qualified undergraduates:**

**GER 590: Special Topics in German**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level German***GER 590A: Special Topics in German: Literature or Literary Criticism**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level German***GER 590B: Special Topics in German: Linguistics**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level German***GER 590C: Special Topics in German: Language Pedagogy**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level German***GER 590D: Special Topics in German: Civilization**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level German*

## Gerontology (GERON)

***Any experimental courses offered by GERON can be found at:***

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****GERON 234: Adult Development**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: HD FS 102 or PSYCH 230*

Introductory exploration of the health, individual and social factors associated with adult development including younger adulthood, middle age and older adulthood. Information is presented from a life-span developmental framework.

**GERON 373: Death as a Part of Living**

(Cross-listed with HD FS). (3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: HD FS 102*

Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes.

**GERON 377: Aging and the Family**

(Cross-listed with HD FS). (3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

Interchanges of older adults and their families. Emphasis on role changes, social interaction, and independence as influenced by health, finances, life styles, and community support.

**GERON 378: Retirement Planning and Employee Benefits**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits.

**GERON 378H: Retirement Planning and Employee Benefits: Honors**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits. Additional work required to meet Honors requirements.



**GERON 466: Gerontology Prepracticum Seminar**

(1-0) Cr. 1. F.S.SS.

*Prereq: 9 credits in core courses for the gerontology minor and approval of the gerontology undergraduate coordinator*

Prepracticum training for students planning a gerontology practicum. Exploration of possible agencies for the practicum, in-depth study of a selected agency, and development of goals and objectives for the practicum.

**GERON 467: Gerontology Practicum**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: GERON 466, advance reservation*

Supervised field experience related to aging. Offered on a satisfactory-fail basis only.

**GERON 490: Independent Study**

Cr. arr.

*Prereq: Permission of Instructor*

Consult program coordinator for procedure.

**Courses primarily for graduate students, open to qualified undergraduates:**

**GERON 501: Seminar**

Cr. arr. Repeatable. F.S.SS.

**GERON 510: Survey of Gerontology**

Cr. 1-3. Repeatable. S.

Provides an overview of important gerontological issues.

**GERON 521: Biological Principles of Aging**

(Cross-listed with EEOB). (3-0) Cr. 3. SS.

*Prereq: BIOL 211 and BIOL 212*

Basic biological principles of aging. Course modules include an introduction to the aging process, body systems and normal aging, and environment and the biology of aging. In addition, disorders and diseases of aging, prevention and treatment and exercise and aging topics will be covered.

**GERON 522: Long-Term Care**

(3-0) Cr. 3. F.

Administration principles involved in the planning, organizing and directing of long-term care agencies. Includes an in-depth exposure to federal and state standards and regulations governing long-term care.

**GERON 523: Mental Health and Aging**

(3-0) Cr. 3. S.

Introduction to the range of issues involved in aging and mental health. From a systems framework the major emotional and psychiatric problems encountered in old age will be examined including mood, anxiety, adjustment and personality disorders, dementia, cognitive problems, substance abuse, and suicide. Barriers to treatment and cohort and cultural issues will be explored.

**GERON 524: Cognitive Health**

(3-0) Cr. 3. SS.

Cognitive skills form the foundation for functioning in everyday life and these skills take on added importance in older adulthood. This course focuses on selected theoretical approaches and current research related to cognitive aging. We will review normative and non-normative cognitive changes, assessment techniques, and prevention/intervention efforts. Throughout the course we will keep the role of environment and life-span implications in the forefront of our discussion.

**GERON 530: Perspectives in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Overview of current aging issues including theory and research, critical social and political issues in aging, the interdisciplinary focus of gerontology, career opportunities, and aging in the future.

**GERON 531: Foundations in Integrative Aging Studies**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Introduction to foundational concepts in the interdisciplinary field of aging studies, including: core theories of adult development and aging how to be critical consumers of aging research; developing writing and other professional skills; and exploring career options in aging.

**GERON 534: Adult Development**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

Exploration of the biological, psychological and social factors associated with aging. Although the focus is on the later years, information is presented from a life-span developmental framework. Empirical studies are reviewed and their strengths, limitations and implications for normative and optimal functioning are discussed.

**GERON 540: Nutrition and Physical Activity in Aging**

(Cross-listed with DIET). (3-0) Cr. 3. F.

WWW only. Basic physiologic changes during aging and their impacts in health and disease. The focus will be on successful aging with special emphasis on physical activity and nutrition. Practical application to community settings is addressed.

**GERON 545: Economics, Public Policy, and Aging**

(Cross-listed with HD FS). (3-0) Cr. 3. F.

Policy development in the context of the economic status of the older adult population. Retirement planning and the retirement decisions; social security and public transfer programs; intra-family transfers to/from the aged; private pensions; financing medical care; prospects and issues for the future.

**GERON 563: Environments for the Aging**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: HD FS 360 or 3 credits in housing, architecture, interior design, rehabilitation, psychology, or human development and family studies or permission of instructor*

Emphasis on independent living within residential settings including specialized shelter, supportive services and housing management. Application of criteria appropriate for accessibility and functional performance of activities; universal design principles. Creative project provides service learning opportunities.

Meets U.S. Diversity Requirement

**GERON 571: Design for All People**

(Cross-listed with ARCH). (3-0) Cr. 3. S.

*Prereq: Graduate or Senior classification*

Principles and procedures of inclusive design in response to the varying ability level of users. Assessment and analysis of existing buildings and sites with respect to standards and details of accessibility for all people, including visually impaired, mentally impaired, and mobility restricted users. Design is neither a prerequisite nor a required part of the course.

Enrollment open to students majoring in related disciplines. Credit counts toward fulfillment of History, Theory, Culture requirements.

**GERON 577: Aging in the Family Setting**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theories and research related to personal and family adjustments in later life affecting older persons and their intergenerational relationships. Related issues including demographics also are examined through the use of current literature.

**GERON 584: Program Evaluation and Research Methods in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. S.

Overview of program evaluation, research methods, and grant writing in gerontology. Includes application of quantitative and qualitative methods in professional settings.

**GERON 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with FS HN, NEURO, NUTRS, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**GERON 590: Special Topics**

Cr. arr. Repeatable.

Consult program coordinator for procedure.

**GERON 591: Internship**

Cr. 1-9. Repeatable, maximum of 9 credits. F.S.SS.

Supervised experience in an area of gerontology.

**GERON 594: Professional Seminar in Gerontology**

(Cross-listed with HD FS). (3-0) Cr. 3. SS.

An integrative experience for gerontology students designed to be taken near the end of the degree program. By applying knowledge gained in earlier coursework, students will strengthen skills in ethical decision-making behavior, applying these skills in gerontology-related areas such as advocacy, professionalism, family and workplace issues. Students from a variety of professions will bring their unique perspectives to bear on topics of common interest.

**GERON 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

**Courses for graduate students:****GERON 630: Theories of Aging**

(3-0) Cr. 3. Alt. SS., offered irregularly.

*Prereq: 6 credits in social sciences or permission of instructor*

Historical, contemporary, and interdisciplinary basis of aging theory. Biological, psychological, sociological, and human developmental conceptualizations of aging will be critically assessed. Emphasis will be placed on conceptual models, as well as theoretical development and application within gerontological research and the field of aging.

**GERON 635: Adult Development, Aging, and Health**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Review of the impact of the growing older adult population as well as individual development and aging on individuals, families, and society. Exploration of theoretical perspectives applied to adult development and aging and distinction of normative and non-normative changes in adulthood. Discussion of methods to assess development across adulthood and consideration of the role of individual and environmental factors impacting efforts to optimize adult development.

**GERON 699: Research**

Cr. arr. Repeatable. F.S.SS.

## Global Resource Systems (GLOBE)

*Any experimental courses offered by GLOBE can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**GLOBE 110: Orientation**

(1-0) Cr. 1. F.

An introduction to Global Resource Systems (GRS) program. University and career acclimation, development of educational and professional skills, participation in GRS Learning Community. Assessed service-learning component.

**GLOBE 120: Geography of Global Resource Systems**

(3-0) Cr. 3. F.S.

A survey of geographic concepts with a specific focus on the distribution of natural and human-generated resources and the demand for those resources on a global scale.

Meets International Perspectives Requirement.

**GLOBE 201: Introduction to Global Resource Systems**

(3-0) Cr. 3. F.S.

A systematic analysis of natural, physical, and socio-economic resources. Examine ways communities prioritize, save, use, and invest in community resources to address their needs and wants in a sustainable way, and the global implications of resource systems decisions. Assessed service-learning component.

**GLOBE 211: Issues in Global Resource Systems**

(1-0) Cr. 1. Repeatable, maximum of 4 credits. F.S.

Discussion of topics of current importance in global resource systems. Offered on a satisfactory-fail basis only. A maximum of 4 credits of 211 may be used towards degree requirements.

**GLOBE 220: Globalization and Sustainability**

(Cross-listed with ANTHR, ENV S, M E, MAT E, SOC). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**GLOBE 221: Apprenticeship**

Cr. R. Repeatable. F.S.SS.

*Prereq: Approval by the Global Resource Systems Faculty Coordinator*

Practical work experience in approved domestic or international settings such as with a company, research laboratory, governmental agency or non-governmental organization. Offered on a satisfactory-fail basis only.

**GLOBE 290: Independent Study**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student.

Comprehensive report required. Intended primarily for first-year students and sophomores.

**GLOBE 290H: Independent Study, Honors**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student.

Comprehensive report required. Intended primarily for first-year students and sophomores.

**GLOBE 303: Agricultural, Food and Natural Global Resource Systems**

(3-0) Cr. 3. F.

*Prereq: GLOBE 201 and ECON 101 or ECON 102 or permission of instructor.*

In-depth analysis of the opportunities, constraints and consequences of agricultural, food and natural resource systems. Topics integrate global natural resources with agriculture and food systems, nutrition and health, sustainable development, and societal structures, including gender, migration and urbanization. Course content utilizes a systems approach.

**GLOBE 304: Socio-Economic Global Resource Systems**

(3-0) Cr. 3. S.

*Prereq: GLOBE 201 and ECON 101 or ECON 102 or permission of the instructor.*

In-depth analysis of the opportunities, constraints and consequences of social, economic and political global resource systems. Topics integrate agriculture and food production, globalization, population, economic planning, energy, security, trade, and policy and their role in defining different world regions. Course content utilizes a systems approach.

**GLOBE 320: Global Resource Systems Internship Preparation**

(1-0) Cr. 1. F.S.

*Prereq: Permission of Instructor*

Students enrolled in this course intend to enroll in Globe 321 or 322 in the following term. Topics provide a pre-departure orientation, including logistical, academic, cultural, and personal requirements for completion of an experiential supervised work experience.

**GLOBE 321: Internship - Global**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: GLOBE 320, Junior or Senior and enrollment in Global Resource Systems major; permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

A supervised learning experience including an analysis of an international location's resource system via immersion in a foreign culture lasting at least five weeks. The experience should focus on the region and technical area consistent with the student's degree track. Course expenses paid by student. A maximum of 12 credits of GLOBE 321 and 322 may be used for degree requirements.

Meets International Perspectives Requirement.

**GLOBE 322: Internship - United States**

Cr. 3-6. Repeatable. F.S.SS.

*Prereq: GLOBE 320, Junior or Senior and enrollment in Global Resource Systems major; permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

A supervised learning experience including an analysis of a domestic location's resource system via immersion in a different culture within the United States lasting at least five weeks. Designed for international students and for students who are not in a position to leave the United States. Course expenses paid by student. A maximum of 12 credits of Globe 321 and 322 may be used for degree requirements.

**GLOBE 330: Global Health Disparities**

(Cross-listed with V MPM). (3-0) Cr. 3. S.

*Prereq: Junior classification*

Historical and contemporary factors contributing to disparities in health outcomes for persons disadvantaged by income, location, ethnicity, sexual orientation, and abilities. Analysis and evaluation of health promotional materials, such as campaigns, and community-based interventions focused on reducing global health disparities.

Meets U.S. Diversity Requirement

**GLOBE 335: The Economics of Global Agricultural Food and Bio-energy**

(Cross-listed with ECON). (3-0) Cr. 3.

*Prereq: ECON 101*

Applied economic analysis of the determinants of world agricultural production, marketing, and use in feed, food, fiber, biofuel, and other applications, and global food processing and consumption. Analysis of market case studies and various data on global agricultural production and transformation, land and resource use, demography, economic activity, nutrition and health trends.

Meets International Perspectives Requirement.

**GLOBE 360: Global Health**

(Cross-listed with MICRO, V MPM). (3-0) Cr. 3. F.

*Prereq: BIOL 211*

Explores human health across the world with particular emphasis on low- and lower-middle-income countries. Attention is given to the interconnectedness of health determinants, problems, and solutions found in global health, including the role of animals and the environment. Broad in scope, highlighting different cultures and the historical foundations of global health. Topics include colonialism, poverty, emerging diseases, climate change, biodiversity, one health, maternal and child health, HIV, malaria, urbanization, noncommunicable diseases and more. Current events will be a feature of all class meetings.

Meets International Perspectives Requirement.

**GLOBE 385: Economic Development**

(Cross-listed with ECON). (3-0) Cr. 3.

*Prereq: ECON 101; ECON 102*

Current problems of developing countries, theories of economic development, agriculture, and economic development, measurement and prediction of economic performance of developing countries, alternative policies and reforms required for satisfying basic needs of Third World countries, interrelationships between industrialized countries and the developing countries, including foreign aid.

Meets International Perspectives Requirement.

**GLOBE 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of faculty coordinator for the major.*

Students must complete GLOBE 398 Cooperative Education Approval Form and register for GLOBE 398 before commencing each work period. Work periods for students in cooperative education related to Global Resource Systems. Offered on a satisfactory-fail basis only.

**GLOBE 401: Senior Project**

Cr. 3. F.S.SS.

*Prereq: Senior classification in Global Resource Systems*

Research project in collaboration with faculty that complements and furthers a student's experiences from Globe 321 and 322 while simultaneously bringing into focus entire four-year experience. Student will write a research report and make either an oral or poster presentation.

**GLOBE 401H: Senior Project, Honors**

Cr. 3. F.S.SS.

*Prereq: Senior classification in Global Resource Systems*

Research project in collaboration with faculty that complements and furthers a student's experiences from Globe 321 and 322 while simultaneously bringing into focus entire four-year experience. Student will write a research report and make either an oral or poster presentation.

**GLOBE 402: Responses to Global Resource System Challenges**

(3-0) Cr. 3. S.

Capstone analysis of critical global resource challenges facing both developed and developing countries. Students will use research skills to investigate specific global resource issues and use communications skills to work as a team to integrate their research, develop an interdisciplinary perspective, and evaluate potential solutions to resource challenges.

**GLOBE 441: International Animal Agriculture**

(Cross-listed with AN S). (3-0) Cr. 3. S.

*Prereq: AN S 223 or AN S 225 or AN S 226 or AN S 229 or AN S 235*

An overview of animal agriculture with emphasis in developing countries. Historical, economic, environmental, and political considerations will be assessed and evaluated. Issues related to gender, resilience and sustainability for different production systems including alternative livestock species, will be investigated. The role of animal source foods in attainment of global food security will be discussed. Meets International Perspectives Requirement.

**GLOBE 480: Engineering Analysis of Biological Systems**

(Cross-listed with A B E, ENSCI). (2-2) Cr. 3. F.

*Prereq: A B E 380 or Permission of Instructor*

Systems-level quantitative analysis of various biological systems, including applications in foods, feeds, biofuels, bioenergy, and other bio-based systems. Introduction to techno-economic analysis and life-cycle assessment of these systems at multiple production scales. Applying these tools to evaluate and improve cost and sustainability performance. Students enrolled in ABE 580 will be required to conduct additional learning activities.

**GLOBE 490: Independent Study**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student. Comprehensive report required. Intended primarily for juniors and seniors. A maximum of 9 credits of all (university-wide) 490 courses may be used for degree requirements.

**GLOBE 490A: Independent Study: General**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student. Comprehensive report required. Intended primarily for juniors and seniors. A maximum of 9 credits of all (university-wide) 490 courses may be used for degree requirements.

**GLOBE 490E: Independent Study: Entrepreneurship**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student. Comprehensive report required. Intended primarily for juniors and seniors. A maximum of 9 credits of all (university-wide) 490 courses may be used for degree requirements.

**GLOBE 490H: Independent Study: Honors**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student. Comprehensive report required. Intended primarily for juniors and seniors. A maximum of 9 credits of all (university-wide) 490 courses may be used for degree requirements.

**GLOBE 490Z: Independent Study: Service Learning**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Independent study on topics of special interest to the student.

Comprehensive report required. Intended primarily for juniors and seniors.

Assessed service-learning component. A maximum of 9 credits of all (university-wide) 490 courses may be used for degree requirements.

**GLOBE 493: Workshop in Global Resource Systems**

Cr. 1-3. Repeatable, maximum of 4 times. F.S.SS.

*Prereq: Permission of Instructor*

Workshop experience in selected topics in global resource systems.

Variable format may include lecture, recitation, laboratory, and field.

Offered on a satisfactory-fail basis only.

**GLOBE 494: Service Learning**

Cr. arr. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State

University entity while instilling a professional ethics and accomplishing

student learning goals. Course expenses paid by student. Assessed

service-learning component.

**GLOBE 494A: Service Learning: International**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State

University entity while instilling professional ethics and accomplishing

student learning goals. Course expenses paid by student. Assessed

service-learning component.

Meets International Perspectives Requirement.

**GLOBE 494B: Service Learning: Domestic**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State

University entity while instilling professional ethics and accomplishing

student learning goals. Course expenses paid by student. Assessed

service-learning component.

**GLOBE 494C: Service Learning: U.S. Diversity Project**

Cr. 3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State

University entity, while instilling professional ethics and accomplishing

student learning goals. Academic work under faculty supervision may

include written reports, presentations, and guided readings. Course

expenses paid by student. Assessed service-learning component.

**GLOBE 495: Global Resource Systems Study Abroad Course Preparation**

Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Global resource systems topics will include the agricultural industries,

climate, crops, culture, economics, food, geography, government,

history, livestock, marketing, natural resources, public policies, soils, and

preparation for travel to locations to be visited. Students enrolled in this

course intend to register for Globe 494A, 496 or 497 the following term.

**GLOBE 496: Global Resource Systems Study Abroad**

Cr. 2-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Extended field trips abroad to study global resource systems. Location

and duration of trips will vary. Pre-trip sessions arranged through Globe

495. Trip expenses paid by student.

Meets International Perspectives Requirement.

**GLOBE 496B: Global Resource Systems Domestic Travel Study**

Cr. 1-4. Repeatable, maximum of 4 times. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Extended domestic field trips to study global resource

systems topics. Location and duration of trips will vary. Pre-trip sessions

arranged. Trip expenses paid by student.

**GLOBE 497: Deans Global Ag and Food Leadership Program**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: 2 credits of GLOBE 495; Permission of Instructor*

An integrated agricultural and food production and policy program that

allows students to assess, analyze and evaluate complex, country-

specific situations and to develop their skills, knowledge and abilities via

team-oriented projects that involve complex issues such as development

of effective foreign food aid and agricultural and food production

systems, drivers of world hunger, sustainable resource management and

efficacy of policy, and the role of the USA and the United Nations and

other development agencies in these systems. International location and

duration of program will vary. Pre-trip sessions arranged through Globe

495. Trip expenses paid by students.

Meets International Perspectives Requirement.

**GLOBE 499: Undergraduate Research**

Cr. arr. F.S.SS.

*Prereq: Permission of the instructor and approval by the Global Resource Systems Faculty Coordinator*

Research projects in collaboration with faculty.

## Graduate Studies (GR ST)

Graduate students may enroll in Graduate Studies (GR ST) courses for professional development or to fulfill certain enrollment requirements.

No major is granted in Graduate Studies.



**Any experimental courses offered by GR ST can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:****GR ST 536: Preparing Publishable Thesis Chapters**

(Cross-listed with ENGL). Cr. 3. F.S.

Reporting original research results within the norms for writing of a student's discipline. Emphasis on preparing thesis/dissertation chapters that will be both acceptable to the Graduate College and ready for submission to a refereed journal in the student's discipline. Focus on reporting results from student-generated original research, norms for discourse within disciplines, and how thesis chapters differ from journal manuscripts.

**GR ST 540: English for Teaching Purposes**

Cr. 1-3. Repeatable, maximum of 2 times. F.S.

Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 540A: English for Teaching Purposes (Intermediate-Low)**

Cr. 3. Repeatable, maximum of 2 times. F.S.

Emphasis on pronunciation improvement and greater fluency in spoken English. Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 540B: English for Teaching Purposes (Intermediate-Mid)**

Cr. 3. Repeatable, maximum of 2 times. F.S.

Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 540C: English for Teaching Purposes (Intermediate-High)**

Cr. 3. Repeatable, maximum of 2 times. F.S.

For students who have completed GR ST 540A or GR ST 540B but have not reached the passing level on the OECT test. Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 540D: English for Teaching Purposes (Advanced)**

Cr. 3. Repeatable, maximum of 2 times. F.S.

Developing explanations, leading discussions and handling questions in a teaching environment. Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 540E: English for Teaching Purposes (Supervised Independent Study)**

Cr. 1. Repeatable, maximum of 2 times. F.S.

Seminar with individual observation and consultation. Placement based upon OECT test results. Persons whose native language is English cannot take GR ST 540 for credit. No more than one section of GR ST 540 may be taken per semester; up to two sections total. Offered on a satisfactory-fail basis only. Credit for GR ST 540 does not apply toward graduation.

**GR ST 565: Responsible Conduct of Research in Science and Engineering (1-0) Cr. 1. F.S.**

*Prereq: Graduate classification*

Ethical and legal issues facing researchers in the sciences and engineering.

**GR ST 566: Communications in Science**

(1-0) Cr. 1. Repeatable, maximum of 8 credits. F.

*Prereq: Graduate classification, instructor permission required*

Focus on enhancing professional communication skills to convey scientific knowledge and discoveries to broader audiences. Emphasis on developing best practices for communicating science to a wide range of specialist and non-specialist audiences including disciplinary researchers, interdisciplinary scholars, industry professionals, governmental bodies, media representatives, and the general public.

**GR ST 567: Time Management and Mentoring**

(0.5-0) Cr. 0.5. Alt. F., offered even-numbered years.

*Prereq: graduate classification*

Balancing life and career; mentoring; lab management.

**GR ST 568: The Interview Process**

(0.5-0) Cr. 0.5. Alt. S., offered odd-numbered years.

*Prereq: graduate classification.*

Applying and interviewing for academia, industry and government.

**GR ST 569: Grant Writing**

(Cross-listed with ENGL). (1-0) Cr. 1. S.

*Prereq: at least two prior years of graduate classification.*

Writing a winning proposal.

**GR ST 570: Teaching Practices**

(0.5-0) Cr. 0.5. Alt. S., offered even-numbered years.

*Prereq: graduate classification.*

Preparation of a teaching portfolio and course materials; lecturing, technology.

**GR ST 585: Preparing Future Faculty Introductory Seminar**

Cr. 2. F.

*Prereq: One year of graduate course work; admission into PFF program via Center for Excellence in Learning and Teaching (CELT)*

Development of job application materials for faculty positions.

Considerations of faculty life issues such as job searches, tenure expectations, position responsibilities, and work-life balance. Visiting speakers from a variety of institutions share their experiences. Written components include presentation reflections and preparation of an application-ready academic job packet.

**GR ST 586: Preparing Future Faculty Intermediate Seminar**

Cr. 3. S.

*Prereq: Admission into PFF program; completion of 585 or permission of instructor*

Development of additional job application materials for faculty positions and a working knowledge of a variety of other faculty skills to successfully navigate the first years on the job: inclusive classroom, ethics, public speaking, career management, and teaching skills from course design to delivery and assessment.

**GR ST 587: Preparing Future Faculty Teaching Practicum**

Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of instructor, GR ST 585, credit for or concurrent enrollment in GR ST 586*

Participants complete a stand-alone teaching experience at Iowa State or another institution of higher education. Written components include journaling, peer observation, reading reflection, and a teaching portfolio suitable for the academic job search process.

**GR ST 588: Preparing Future Faculty Special Topics**

Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of instructor.*

In-depth study of topic providing further academic professional development. Written components include journaling, project management, a project report, and a reading reflection.

**Courses for graduate students:**

**GR ST 680: Doctoral Post Prelim (Continuous) Registration**

Cr. R. Repeatable. F.S.

*Prereq: Permission required from Graduate College*

Reserved for doctoral students on pre-approved leave (medical, military, maternity, family/emergency) who have passed the preliminary exam and have not yet taken the final exam. Offered on a satisfactory-fail basis only.

**GR ST 681: Required Registration**

Cr. 1. Repeatable. F.S.SS.

Eligible for graduate students to meet registration requirement. Offered on a satisfactory-fail basis only.

**GR ST 681A: Required Registration: Doctoral Continuous Registration**

Cr. 1. Repeatable, maximum of 6 times. F.S.

*Prereq: Must have taken and passed preliminary oral exam.*

Course is available for students pursuing doctoral degrees who have passed their preliminary oral examination. Continuous enrollment is required for PhD students during fall and spring semesters between the preliminary oral exam and their final oral examination. Offered on a satisfactory-fail basis only. This course cannot be used toward graduation.

**GR ST 681B: Required Registration: Final Exam Only**

Cr. 1. Repeatable. F.S.SS.

*Prereq: Completed all necessary requirements to take final exam, including submitted Application for Graduation.*

Course is available for students who are ready to have their Final Oral Examination. Enrollment is required for students during the semester of their final oral examination. Late registration of this course requires that the Request for Final Oral Examination has been submitted. Offered on a satisfactory-fail basis only. This course cannot be used toward graduation.

**GR ST 681C: Required Registration: Graduate Assistant Enrollment**

Cr. 1. Repeatable.

*Prereq: Student needs to be appointed to a graduate assistantship.*

Offered on a satisfactory-fail basis only. This course cannot be used toward graduation.

**GR ST 697: Curricular Practical Training**

Cr. R. Repeatable. F.S.SS.

Professional work period.

## Graphic Design (ARTGR)

**Any experimental courses offered by ARTGR can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**ARTGR 270: Graphic Design Studio I**

(0-6) Cr. 3. F.

*Prereq: DSN S 102, DSN S 131; admission to the graphic design program through department review*

Introduction to the fundamental skills required in the graphic design profession.

**ARTGR 271: Graphic Design Studio II**

(0-6) Cr. 3. S.

*Prereq: ARTGR 270*

Reinforces and further explores the fundamental skills, principles, and tools required for effective visual communication.

**ARTGR 272: Digital Photography for Graphic Design**

(0-6) Cr. 3. F.S.

*Prereq: Concurrent enrollment in ARTGR 270 OR ARTGR 271*

This course will address the development of "seeing" as a medium design, expression, and visual communication including compositional dynamics, advanced digital image manipulation, software usage and support, digital camera operations along with scanning and other digital input devices, color management, digital format for presentation and printing with digital ready formats.

**ARTGR 273: Typography I**

(0-6) Cr. 3. F.

*Prereq: Concurrent enrollment in ARTGR 270*

Emphasizes foundational typographic principles from letterform construction to hierarchies of extended text, directed toward typographic vocabulary, and typographic organization. Students will also understand both classical and contemporary typographic forms, as well as having the ability to construct typographic compositions and systems.

**ARTGR 274: Typography II**

(0-6) Cr. 3. S.

*Prereq: Concurrent enrollment in ARTGR 271*

Advances the skills and principles learned in Graphic Design Typography I. Exploration of more complex problems that address typographic hierarchy, context, sequence and typography and image.

**ARTGR 275: Graphic Technology I**

(0-6) Cr. 3.

Basic 2-dimensional computer skills for graphic design.

**ARTGR 276: Graphic Technology II**

(0-6) Cr. 3. S.

Basic 3-dimensional computer skills for graphic design.

**ARTGR 281: Visual Communication and Branding**

(3-0) Cr. 3. F.

Introduction to basic principles of visual communication that contribute to the successful comprehension of intended visual messages; these include promotional messages, such as corporate branding and marketing campaigns, as well as informational messages, such as those used in computer interface design or in the clear presentation of diagrammatic data. Emphasis is placed on sensitivity to the diversity of the intended American or global audience, and to the cross-cultural differences that may affect the ways that visual messages are interpreted. Methods for creating brand experiences are explored as they apply to both small and large enterprises, ranging from personal brand to corporate brand identities.

**ARTGR 370: Graphic Design Studio III**

(0-6) Cr. 3. F.

*Prereq: ARTGR 271, ARTGR 276, and credit or concurrent enrollment in ARTGR 387*

Creation and design of images and symbols for communication. Application and integration of typography with images and symbols.

**ARTGR 371: Graphic Design Studio IV**

(0-6) Cr. 3. S.

*Prereq: ARTGR 370; ARTGR 387*

Development and preparation of design concepts for application to the printing and electronic publishing process. Creative problem-solving skills, introduction to systems design.

**ARTGR 372: Graphic Materials and Processes**

(3-0) Cr. 3.

*Prereq: Junior standing within the graphic design program.*

Introduction to the processes and materials involved in graphic design production. Course covers production ranging from pre-press to digital media.

**ARTGR 377: Graphic Design Internship Seminar**

(1-0) Cr. 1.

*Prereq: Junior standing within the graphic design program.*

Professional preparation for graphic design internship.

**ARTGR 378: Critical Issues in Graphic Design**

(2-0) Cr. 2.

*Prereq: Credit or concurrent enrollment in ARTGR 370*

Lecture, discussion and writing about the critical issues facing the communications field today and in the future.

**ARTGR 383: A Concise History of Graphics and Sports.**

(3-0) Cr. 3. S.

This introduction to basic concepts of branding in design explores the processes of sports, graphics of sports, design criteria of sport objects, consumer trends, and social importance of sports will be discussed. This course takes a historical perspective of sport graphics and objects starting at the first known understanding of what could be considered "Sport," from ancient times to the present. Interpretation of sport graphics and sport objects. Measuring the sports impact and associated graphics with emotions; sounds that date the sport or strengthen our memories of them, photographs of objects and people from different periods, images of industrial, sport, agrarian and city landscapes to remind us of the dominant role played by sport/graphics or that sport object in the country of its origin.

**ARTGR 387: Graphic Design History/Theory/ Criticism I**

(Dual-listed with ARTGR 587). (3-0) Cr. 3. F.

Late nineteenth century to the 1990s. This course will explore the cultural, social, political, industrial, and technological forces that have influenced the practice of graphic design in Britain, Europe, and the United States. Students will study the historical issues and problems facing designers, their clients, and their publics. Meets International Perspectives Requirement.

**ARTGR 388: Graphic Design History/Theory/ Criticism II**

(Dual-listed with ARTGR 588). (3-0) Cr. 3. S.

Critical issues that affect the contemporary practice of graphic design as it relates to the United States. Students will study a variety of issues that include, but are not exclusive to, new media, gender, class, design and the public sphere, design as social action, postmodern design theory, sustainability, and ethical practice.

**ARTGR 391: Graphic Design Field Study**

(0-1) Cr. 1. Repeatable, maximum of 2 credits.

*Prereq: Concurrent enrollment in 300 or 400 level graphic design studio course*

Travel, study, and tours of areas of interest within the graphic design profession such as print production companies, design studios, and museums. Offered on a satisfactory-fail basis only.

**ARTGR 463: 3D Motion Graphics**

(Dual-listed with ARTGR 563). (0-6) Cr. 3. S.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

3D visualization in a Motion Graphics context. Emphasis on design in 3D computer animation as it relates to various electronic media.

**ARTGR 464: Digital Imaging**

(Dual-listed with ARTGR 564). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

Studio in experimental techniques using the digital drawing tablet combined with manual drawing mediums, exploring the digital tablet, scanner, and camera as ways to collect and make images, conceptual and compositional development of digital techniques and software, and connecting digital techniques to visual processes and ideation. Understanding of different ways of working digitally while exploring image-making processes.

**ARTGR 470: Graphic Design Studio V**

(0-6) Cr. 3. F.

*Prereq: ARTGR 371*

Advanced design systems as applied to corporate identity and environmental graphic design. Symbolology as an integrated component of communication systems.

**ARTGR 471: Graphic Design Capstone**

(0-6) Cr. 3. S.

*Prereq: ARTGR 470 or permission of instructor*

Experience design and innovation in a multi-disciplinary design studio. Class will use unique research, design, evaluation, creativity, and innovation methodologies to solve human problems on special topics. Designed solutions will be in the form of products, artifacts, interfaces, information, and human environments.

**ARTGR 472: Photography and Narrative Messaging**

(Dual-listed with ARTGR 572). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

Photography as a tool for creating conceptually-driven images and metaphors. Emphasis is on photography as an evocative storytelling device for a range of audiences and design applications. Compositional and technical aspects are explored to ensure successful interpretation of the photograph's intended message.

**ARTGR 473: Multimedia Design**

(Dual-listed with ARTGR 573). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

The design of visual, aural and textual communication for electronic media.

**ARTGR 474: Exhibition Design**

(Dual-listed with ARTGR 574). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*  
Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions, trade show booth design, and modular unit design for traveling exhibitions. Translation of graphic information to a three-dimensional space.

**ARTGR 475: Advanced Typography**

(Dual-listed with ARTGR 575). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program Graduate: Graduate classification in College of Design*  
Typographic theory exploring traditional and non-traditional forms, both historical and contemporary typographic achievements.

**ARTGR 476: Graphic Design Methodology**

(Dual-listed with ARTGR 576). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program Graduate: Graduate enrollment in College of Design*  
Analysis and application of scientific, systematic, and non-traditional problem-solving and problem-seeking techniques.

**ARTGR 477: Graphic Design Practicum**

(0-6) Cr. 3.

*Prereq: Concurrent enrollment in ARTGR 370, ARTGR 371, or ARTGR 470*  
Graphic design outreach and problem solving. Individual and group projects for non-profit clients selected by the instructor.

**ARTGR 478: Graphic Design Advanced Web Design**

(Dual-listed with ARTGR 578). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*  
The development of advanced and experimental web design.

**ARTGR 479: Wayfinding Design**

(Dual-listed with ARTGR 579). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*  
Study of the navigational challenges of built environments and outdoor spaces, including site analysis, development of navigational plans, and design of wayfinding sign systems. Issues of function, accessibility, legibility, and fabrication are considered.

**ARTGR 480: Graphic Design Internship**

(3-0) Cr. 3. SS.

*Prereq: ARTGR 377, 12 credits in graphic design; permission of instructor, registration in advance of enrollment*  
Graphic design experience in an off-campus professional environment.

**ARTGR 481: Graphic Design Professional Practices**

(3-0) Cr. 3. S.

*Prereq: Credit or concurrent enrollment in ARTGR 470*  
Professional design management: ethics, setting up a new business, client/designer relationships, contractual options, billing practices, and effective operating procedures.

**ARTGR 482: Professional Presentation**

(0-6) Cr. 3.

*Prereq: Junior or senior standing within the graphic design program*  
Exploration and development of job application materials and presentation skills.

**ARTGR 483: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with ARTGR 583). (Cross-listed with NREM). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*  
Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**ARTGR 484: Selected Studies in Graphic Design**

(Dual-listed with ARTGR 584). Cr. 1-3. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*  
Special issues related to graphic design. Topics vary each time offered. Topics not to be repeated.

**ARTGR 489: Design Ethics.**

(3-0) Cr. 3.

*Prereq: Junior/Senior classification.*  
Historical and contemporary issues in ethics and decision-making related to visual arts, related visual communication, and design disciplines, including education/training, professional practice and research, the social role of design, and the implications and consequences of designed artifacts and systems.

**ARTGR 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*  
Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.



**ARTGR 490A: Independent Study: Theory, Criticism, and Methodology**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTGR 490B: Independent Study: Two-Dimensional Design**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTGR 490C: Independent Study: Three-Dimensional Design**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTGR 490H: Independent Study: Honors**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTGR 490I: Internship/Cooperative (in-depth experience other than ArtGr 480)**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed related graphic design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTGR 491: Publication Design**

(Dual-listed with ARTGR 591). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

The philosophy, concepts, and structures of publication design.

**ARTGR 492: Graphic Design Systems Thinking**

(Dual-listed with ARTGR 592). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

The philosophy, concepts, and structures of systems thinking in graphic design.

**ARTGR 493: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Evidence of satisfactory experience in area of specialization*

Intensive 2 to 4 week studio exploration. Topics vary each time offered.

**ARTGR 495: Graphic Design Abroad**

(Dual-listed with ARTGR 595). Cr. 3. SS.

*Prereq: Permission of instructor*

International study abroad program with visits to design studios, art museums, and educational facilities.

**ARTGR 496: Graphic Design Semester Abroad**

Cr. R. Repeatable.

*Prereq: Concurrent enrollment in Iowa State University Graphic Design Study Abroad Rome Program or an equivalent approved program; DSN S 301 is a prerequisite for students going to Rome.*

Study and tours of museums, galleries, artist and/or designer studios, and other areas of interest within art and design. Offered on a satisfactory-fail basis only.

**ARTGR 497: Graphic Design Field Study**

(0-1) Cr. 1. Repeatable. F.S.SS.

*Prereq: Acceptance to the undergraduate or graduate programs in graphic design.*

Introduction to places related to graphic design in urban environments such as museums and design studios. Culture and context of design in the urban environment. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ARTGR 510: Graphic Design Theory**

(3-0) Cr. 3. F.

*Prereq: Graduate classification in College of Design or permission of instructor.*

This course will investigate graphic design as a tool to represent and create imageability in the mind of the audience, through relevant readings in graphic design theory and principles of visual organization in various media.



**ARTGR 511: Graphic Design Graduate Studio I**

(0-6) Cr. 3. F.

*Prereq: Graduate classification in College of Design or permission of instructor.*

Introduction to a range of research topics, methods, and ideas that are predicated on learning through the process of creation.

**ARTGR 512: Audience and Perception**

(0-6) Cr. 3. F.

*Prereq: Graduate classification in College of Design or permission of instructor.*

Theory and investigation of systems, structures, principles of visual organization for communication through the experimental application of traditional and non-traditional media. Studio problems will be influenced by social, cultural, environmental, or technological factors.

**ARTGR 520: Design & Cultural Semiotics**

(3-0) Cr. 3. S.

*Prereq: Graduate classification in College of Design or permission of instructor.*

Introduction to semiotics as it relates to art, design and culture. Historical and contemporary vantage points and the importance of designers as makers of meaning. Key concepts of semiotics and the interrelationship between message, meaning, design and culture.

**ARTGR 521: Graphic Design Graduate Studio II**

(0-6) Cr. 3. S.

*Prereq: Enrollment in the Graphic Design Graduate Program or permission of instructor.*

In this advanced graduate graphic design studio led by a variety of faculty, students will be introduced to a range of research topics, methods and ideas that are predicated on learning through the process of creation.

**ARTGR 522: Critical Media**

(0-6) Cr. 3. S.

*Prereq: Enrollment in the Graphic Design Graduate Program or permission of instructor.*

Advanced theory and investigation of critical media and application of principles of visual organization for communication. Through hypothetical design work with critical media tools, studio problems will examine and be informed by social, cultural, environmental, or technological factors.

**ARTGR 530: User Engagement**

(0-6) Cr. 3.

*Prereq: Graduate enrollment in the Graphic Design Program or graduate enrollment in College of Design or permission of instructor*

The exploration and design of interface/interaction with products, systems, and technologies.

**ARTGR 531: Graphic Design Graduate Project Preparation**

(0-1) Cr. 1. F.

*Prereq: Acceptance to graphic design graduate program.*

Exploration, formulation, and structuring of graduate thesis/creative component topics, investigation of design research and creative scholarship. Offered on a satisfactory-fail basis only.

**ARTGR 540: Design for Behavioral Change.**

(0-6) Cr. 3.

*Prereq: Graduate enrollment in the Graphic Design Program or graduate enrollment in College of Design or permission of instructor*

The exploration and design of educational experiences and artifacts as they relate to the social, emotional, and behavioral aspects of society.

**ARTGR 563: 3D Motion Graphics**

(Dual-listed with ARTGR 463). (0-6) Cr. 3. S.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

3D visualization in a Motion Graphics context. Emphasis on design in 3D computer animation as it relates to various electronic media.

**ARTGR 564: Digital Imaging**

(Dual-listed with ARTGR 464). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

Studio in experimental techniques using the digital drawing tablet combined with manual drawing mediums, exploring the digital tablet, scanner, and camera as ways to collect and make images, conceptual and compositional development of digital techniques and software, and connecting digital techniques to visual processes and ideation. Understanding of different ways of working digitally while exploring image-making processes.

**ARTGR 572: Photography and Narrative Messaging**

(Dual-listed with ARTGR 472). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

Photography as a tool for creating conceptually-driven images and metaphors. Emphasis is on photography as an evocative storytelling device for a range of audiences and design applications. Compositional and technical aspects are explored to ensure successful interpretation of the photograph's intended message.

**ARTGR 573: Multimedia Design**

(Dual-listed with ARTGR 473). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

The design of visual, aural and textual communication for electronic media.

**ARTGR 574: Exhibition Design**

(Dual-listed with ARTGR 474). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

Visual communication applied to exhibition design focusing on educational or interactive museum exhibitions, trade show booth design, and modular unit design for traveling exhibitions. Translation of graphic information to a three-dimensional space.

**ARTGR 575: Advanced Typography**

(Dual-listed with ARTGR 475). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program Graduate: Graduate classification in College of Design*

Typographic theory exploring traditional and non-traditional forms, both historical and contemporary typographic achievements.

**ARTGR 576: Graphic Design Methodology**

(Dual-listed with ARTGR 476). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program Graduate: Graduate enrollment in College of Design*

Analysis and application of scientific, systematic, and non-traditional problem-solving and problem-seeking techniques.

**ARTGR 578: Graphic Design Advanced Web Design**

(Dual-listed with ARTGR 478). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

The development of advanced and experimental web design.

**ARTGR 579: Wayfinding Design**

(Dual-listed with ARTGR 479). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design*

Study of the navigational challenges of built environments and outdoor spaces, including site analysis, development of navigational plans, and design of wayfinding sign systems. Issues of function, accessibility, legibility, and fabrication are considered.

**ARTGR 583: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with ARTGR 483). (Cross-listed with NREM). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**ARTGR 584: Selected Studies in Graphic Design**

(Dual-listed with ARTGR 484). Cr. 1-3. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

Special issues related to graphic design. Topics vary each time offered. Topics not to be repeated.

**ARTGR 587: Graphic Design History/Theory/ Criticism I**

(Dual-listed with ARTGR 387). (3-0) Cr. 3. F.

Late nineteenth century to the 1990s. This course will explore the cultural, social, political, industrial, and technological forces that have influenced the practice of graphic design in Britain, Europe, and the United States. Students will study the historical issues and problems facing designers, their clients, and their publics.

Meets International Perspectives Requirement.

**ARTGR 588: Graphic Design History/Theory/ Criticism II**

(Dual-listed with ARTGR 388). (3-0) Cr. 3. S.

Critical issues that affect the contemporary practice of graphic design as it relates to the United States. Students will study a variety of issues that include, but are not exclusive to, new media, gender, class, design and the public sphere, design as social action, postmodern design theory, sustainability, and ethical practice.

**ARTGR 589: Design and Ethics**

(Cross-listed with HCI). (3-0) Cr. 3. F.S.

*Prereq: Graduate classification or permission of instructor.*

Issues in ethics and decision-making as they relate to technology, design, design research, HCI, and the design industry.

**ARTGR 590: Special Topics**

Cr. arr.

*Prereq: Bachelor's degree in graphic design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTGR 590A: Special Topics: Theory, Criticism, and Methodology**

Cr. arr.

*Prereq: Bachelor's degree in graphic design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTGR 590B: Special Topics: Two-Dimensional Design**

Cr. arr.

*Prereq: Bachelor's degree in graphic design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTGR 590C: Special Topics: Three-Dimensional Design**

Cr. arr.

*Prereq: Bachelor's degree in graphic design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTGR 591: Publication Design**

(Dual-listed with ARTGR 491). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

The philosophy, concepts, and structures of publication design.

**ARTGR 592: Graphic Design Systems Thinking**

(Dual-listed with ARTGR 492). (0-6) Cr. 3.

*Prereq: Undergraduate: Junior or senior standing in the graphic design program. Graduate: Graduate enrollment in College of Design.*

The philosophy, concepts, and structures of systems thinking in graphic design.

**ARTGR 593: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification; evidence of satisfactory experience in area of specialization*

Intensive 2 to 4 week studio exploration. Topics vary each time offered.

**ARTGR 595: Graphic Design Abroad**

(Dual-listed with ARTGR 495). Cr. 3. SS.

*Prereq: Permission of instructor*

International study abroad program with visits to design studios, art museums, and educational facilities.

**ARTGR 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**ARTGR 610: Thesis Preparation Studio**

(0-6) Cr. 3. S.

*Prereq: ARTGR 531, Graduate enrollment in the College of Design.*

Initial development and exploration of graduate thesis topic, investigation of design research and creative scholarship. Determine Faculty Committee and Program of Study and file forms with Graduate College.

**ARTGR 620: Graduate Thesis Studio I**

(0-6) Cr. 3. F.

*Prereq: ArtGr 610.*

Advanced creative scholarship in specialized area of focus within graphic design. Culminates in a development plan, preliminary design work, and supporting documentation.

**ARTGR 630: Graduate Thesis Studio II**

(0-6) Cr. 3. S.

*Prereq: ArtGr 620*

Advanced research component in specialized area of focus within graphic design. Advances a development plan, preliminary design work, and supporting documentation.

**ARTGR 690: Advanced Topics**

Cr. arr. Repeatable.

**ARTGR 699: Research-Thesis**

Cr. arr. Repeatable.

## Health Studies (H S)

***Any experimental courses offered by H S can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**H S 105: First Aid and Emergency Care**

(1-2) Cr. 2. F.S.SS.

Discussion and application of the basic techniques of utilizing bloodborne pathogen safety measures, administering first aid and cardiopulmonary resuscitation. ARC layperson certification available.

**H S 110: Personal and Consumer Health**

(3-0) Cr. 3. F.S.

Physical, mental, emotional and social aspects of health as a basis for understanding and promoting health, and preventing poor health conditions. Study of personal responsibility on the long-term benefits of maintaining a high level of wellness and health. Identification and mitigation of negative lifestyle habits.

**H S 275: Health Education in the Elementary School**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 102 or HD FS 226*

The application of instructional strategies related to health education and physical education for teachers at the elementary level. Credit for both H S 275 and 375 may not be applied toward graduation.

**H S 285: Pre-Internship in Kinesiology and Health**

(Cross-listed with KIN). Cr. 1-2. F.S.

*Prereq: Kinesiology and Health major; credit or concurrent enrollment in KIN 258; Permission of Internship Coordinator*

Pre-internship experience with a health organization based on option.

Offered on a satisfactory-fail basis only.

**H S 290: Independent Study**

Cr. 1. Repeatable, maximum of 3 credits. F.S.

*Prereq: 2nd semester Freshmen or Sophomore classification; Permission of Instructor*

Study under supervision of faculty.

**H S 305: Instructor's First Aid and Cardiopulmonary Resuscitation**

(1-2) Cr. 2. F.S.

*Prereq: H S 105*

Discussion and practice of skills needed to teach CPR, AED, and first aid content related to the American Red Cross curriculum. Instructor candidates must possess valid certification for adult and pediatric CPR/AED/First Aid at beginning of course.

**H S 310: Community and Public Health**

(3-0) Cr. 3. F.S.

*Prereq: H S 110*

Introduction to community health problems, programs of prevention, environmental health agencies, and health services. Study of local, state, and national community health agencies, their purposes and functions.

**H S 350: Human Diseases**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 255; BIOL 256; H S 110*

Discussion of disease process and ill-health in the twentieth century. Emphasis on epidemiology, prevention, treatment, and the understanding of the etiology of communicable and noncommunicable diseases.

**H S 375: Teaching-Learning Process in Health Education**

(3-0) Cr. 3. F.

*Prereq: H S 105; H S 110*

Principles, methods, materials, and resources involved in the teaching of health. Includes organization and development of the health education curriculum (K-12). Credit for both H S 275 and 375 may not be applied toward graduation.

**H S 380: Worksite Health Promotion**

(3-0) Cr. 3. F.S.

*Prereq: KIN 258*

The design and implementation of worksite health promotion programs and the benefits these programs have for both employees and employers. Review of various health risk appraisals and planning theory-based incentive programs designed to promote positive lifestyles.

**H S 385: Preparation and Search Strategies for Kinesiology and Health Internships**

(Cross-listed with KIN). Cr. 0.5. F.S.

*Prereq: Junior classification*

Preparation of relevant material for a successful internship/career search. Specific internship timeline, process, procedures will be reviewed. Course needs to be taken a minimum of two semesters prior to required internship.

**H S 417: Supervised Teaching in Health Education in the Secondary School**

Cr. 16. F.S.

*Prereq: H S 375*

Advance registration required.

**H S 417A: Supervised Teaching in Health Education in the Secondary School: Initial Endorsement**

Cr. 16. F.S.

*Prereq: H S 375*

Students must be fully admitted to Teacher Education and must apply for approval to enroll at the beginning of the semester prior to registering.

**H S 417B: Supervised Teaching in Health Education in the Secondary School: Additional Endorsement**

Cr. arr. F.S.

*Prereq: H S 375*

Students must be fully admitted to Teacher Education and must apply for approval to enroll at the beginning of the semester prior to registering.

**H S 430: Community Health Program Development**

(3-0) Cr. 3. F.

Techniques of needs assessment, program design, administration, and evaluation of community health education programs in various settings.

**H S 464: Physical Activity Epidemiology**

(Dual-listed with H S 564). (3-0) Cr. 3. F.S.

*Prereq: (H S 350 or KIN 358); (STAT 101 or STAT 104 or STAT 226)*

Understanding health benefits of physical activity on chronic disease prevention and health promotion throughout the life span, from clinical and public health perspectives. Discussion and application of real-life physical activity assessment, research, guidelines, and promotion in population levels.

**H S 485: Internship in Health Studies**

Cr. 8-12.

*Prereq: Senior classification; Permission of Internship Coordinator*

Advance registration required. Supervised experience in health related agencies. Offered on a satisfactory-fail basis only.

**H S 485A: Internship in Health Studies: Community and Public Health**

Cr. 8-12. F.S.SS.

*Prereq: KIN major; C- or better in (KIN 358; KIN 359; KIN 366; H S 310; H S 350; H S 430); Cumulative GPA 2.0; Permission of Internship Coordinator*  
Observation and practice in selected community and public health agencies. Offered on a satisfactory-fail basis only.

**H S 485B: Internship in Health Studies: Physical Activity and Health Promotion**

Cr. 8-12. F.S.SS.

*Prereq: KIN major; C- or better in (KIN 358; KIN 359; KIN 366; KIN 458; KIN 467; H S 350); Cumulative GPA 2.0; Permission of Internship Coordinator*  
Observation and practice in selected physical activity and health promotion agencies. Offered on a satisfactory-fail basis only.

**H S 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

**Courses primarily for graduate students, open to qualified undergraduates:**

**H S 564: Physical Activity Epidemiology**

(Dual-listed with H S 464). (3-0) Cr. 3. F.S.

*Prereq: (H S 350 or KIN 358); (STAT 101 or STAT 104 or STAT 226)*

Understanding health benefits of physical activity on chronic disease prevention and health promotion throughout the life span, from clinical and public health perspectives. Discussion and application of real-life physical activity assessment, research, guidelines, and promotion in population levels.

## Healthcare Management (HCM)

*Any experimental courses offered by HCM can be found*

*at:* [registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**HCM 301: Introduction to the US Healthcare Industry**

Cr. 3. F.S.SS.

*Prereq: Sophomore classification; ENGL 150*

Introduces and provides an overview of the US healthcare delivery system for healthcare managers. Includes the theoretical basis for the system, its history and development, the resources that comprise it, as well as its overall planning, organization, management, evaluation, quality, professions, and its major health policy issues. Examines how healthcare policy is developed at the federal and state levels, considers the influence of all constituencies in policy formation, and compares existing policy and policy formation in other countries to the U.S. Explores how the healthcare policy environment affects the work of healthcare managers.

**HCM 302: Economics for Healthcare Managers**

Cr. 3. F.S.

*Prereq: ECON 101; ECON 102*

Explores the economic influences and underpinnings of the healthcare delivery system. Examines the importance of economics in healthcare decisions, both demand and supply-side factors, and how third-party payers and public policy influence consumption and production of healthcare. Introduces evaluation of clinical outcomes using cost-effectiveness and other decision-analysis tools, as well as topics such as asymmetry of information, comparative healthcare systems, and healthcare policy.

**HCM 303: Healthcare Quality Management**

(Cross-listed with SCM). Cr. 3. F.S.

*Prereq: SCM 301; credit or concurrent enrollment in HCM 301*

Addresses the manager's role in improving healthcare quality and outcomes, including clinical and organizational improvement, and quality improvement practices. Explores how healthcare delivery systems can better measure outcomes from both patient and organizational perspectives. Analyzes quality improvement programs and examines their adaptability to the healthcare environment.

**HCM 401: Financial Management for Healthcare Organizations**

(Cross-listed with ACCT). Cr. 3. F.S.

*Prereq: FIN 301; credit or concurrent enrollment in HCM 301*

Examination of the current accounting system for, and the financing of, health care and the factors affecting the industry. Exploration and analysis of budgetary concepts, financial management, cost accounting, and management under rate control and competition, as well as the differences between the goods and service industries. Additional areas of discussion include the practical application of health care finance theory as it applies to the current healthcare environment. The revenue and expense applications will be explored in-depth, particularly in relation to the delivery of health care services. Specific emphasis will be placed on understanding the components of the income statement and balance sheet, developing a budget, and using these financial statements for analyzing operational changes.

**HCM 402: Law and Regulatory Environment in Healthcare**

Cr. 3.

*Prereq: ACCT 215; PHIL 230; credit or concurrent enrollment in HCM 301*

An in-depth look at the legal and regulatory environment of healthcare management and practice. Explores aspects of employer-employee relations in the health care setting and legal ramifications of patient treatment and medical records. Discusses the importance of healthcare managers being familiar with the laws and regulations of healthcare. Included may be considerations of governmental, accreditation, and professional associations' oversight.

**HCM 403: Healthcare Information Systems**

(Cross-listed with MIS). Cr. 3.

*Prereq: MIS 301; credit or concurrent enrollment in HCM 301*

Explores the critical role information technologies and systems play in healthcare organizations. The focus is on evaluating and implementing software and IT systems that facilitate delivery of health care; understanding information technology governance, data privacy, and security; planning and project management; and tracking future developments of information technology in healthcare management. Introduction to Electronic Health Records (EHR) and other Management and Financial Information System applications used by healthcare organizations.

## Higher Education (HG ED)

*Any experimental courses offered by HG ED can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**HG ED 504: History of Higher Education in the United States**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Survey course in the history of higher education in the United States, from the colonial era to the present. Emphasis is placed on enduring debates about the purpose(s) of higher education and issues of equity and access along lines of race, class, and gender. Readings include primary and secondary materials.

**HG ED 538: Foundations of Engineering Education**

(Cross-listed with AER E, ENGR). Cr. 3. F.

*Prereq: Engineering graduate students or instructor permission required*

Introduction to the field of engineering education, with an emphasis on engineering education history, existing challenges, teaching and learning pedagogies and theories, research opportunities, and research methodologies. The course goal is to develop students as scholars and to have students think critically about engineering and education. Students will apply the knowledge gained from this course to propose a research project related to their own discipline. The proposal is intended to help students learn and apply the key elements of engineering education research. This course is intended for students with a variety of interests and career goals, including those interested in learning to conduct engineering education research, exploring research discoveries about teaching and learning, and engaging with the engineering education community.

**HG ED 544: Foundations of Leadership & Learning**

(3-0) Cr. 3.

*Prereq: graduate student classification*

Introduction to leading and learning in higher education. Course will include concepts, competencies, and skills necessary for leading higher education organizations, the various roles leaders may fill within the higher education sector, using assessment for improvement as a leader in higher education.

**HG ED 552: Introduction to Higher Education in the United States**

(3-0) Cr. 3.

*Prereq: Graduate student classification*

Overview of higher education in the United States, including a brief history, the functions, organization, external influences, funding, and the major issues impacting postsecondary institutions today.

**HG ED 561: College Teaching**

(3-0) Cr. 3.

*Prereq: 6 graduate credits*

Educational theories, methods and strategies for the improvement of college instruction. Assist potential college instructors in developing knowledge of protocol, assessment, and the scholarship and art of teaching. Emphasis on the unique challenge of college teaching in a changing student population environment.



**HG ED 562: Curriculum Development in Colleges**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Modes of curriculum design, development, and change in colleges. Development of curricular leadership and evaluation strategies.

**HG ED 568: Global Education Policy Analysis**

(3-0) Cr. 3.

*Prereq: HG ED 504*

Assessment of global education policy issues in education. Analysis of policies, implementation strategies, and policy outcomes.

**HG ED 570: Current Topics in Student Affairs**

Cr. 1-3.

*Prereq: Graduate classification*

Current issues and new directions in student affairs practice. Topics developed to the specific needs of student affairs professionals. Primarily for off-campus.

**HG ED 572: Resource Management in Higher Education**

(3-0) Cr. 3. F.

An examination of resource management in higher education. Planning, allocation, and administration of financial, human, and physical resources in colleges and universities.

**HG ED 573: Equity, Diversity, and Inclusion in Student Affairs**

(3-0) Cr. 3.

*Prereq: Graduate Standing*

Explores theories of equity, diversity, and inclusion to build knowledge and skills related to social justice in student affairs practice.

**HG ED 574: Student Affairs Practice in Higher Education**

(3-0) Cr. 3.

*Prereq: Graduate classification, admission to Higher Education Program*

Introduction to the profession of Student Affairs in higher education. As a survey course, readings, learning artifacts, and class discussions will be used to uncover a breadth of topics related to the student affairs profession. Course content is organized around, but will not be limited to, the history, philosophical underpinnings, values, ethics, and standards espoused, as well as the concepts of learning and community development.

**HG ED 575: Organization and Administration of Student Affairs**

(3-0) Cr. 3.

*Prereq: Admission to Higher Education Program, HG ED 574*

Topics related to organization and administration of student affairs in higher education. The course surveys organizational and administrative aspects of student affairs within the broader context of post-secondary education with particular attention paid to organizational development, budget and finance, and law and policy.

**HG ED 576: Student Development in Higher Education**

(3-0) Cr. 3.

*Prereq: Graduate Standing*

Theories of student and adult development and their applications in student affairs programs, services, and activities are reviewed. Emphasis is placed on theories exploring psychosocial, cognitive, moral, and social identity development as well as on integrated theories of development.

**HG ED 577: Campus Environments and Cultures**

(3-0) Cr. 3.

*Prereq: Admission to Higher Education Program*

Study of the impact of the college environment on students and use of environmental theory to create positive learning situations for students.

**HG ED 578: Students in U.S. Higher Education**

(3-0) Cr. 3.

*Prereq: Admission to Higher Education Program*

The relationship between college students and characteristics from 1950 to the present. Traditional assumptions about the impact of higher education on students will be reviewed and challenged. Campus issues and concerns relative to commuters and residential life. Participants will analyze institutional responses to students through college missions, organizational development, structure, core curriculum and retention.

**HG ED 579: Advising and Supporting**

(3-0) Cr. 3.

*Prereq: HG ED 574, HG ED 576*

Development of effective, basic counseling skills. Understanding of group dynamics. Ability to work effectively in groups.

**HG ED 580: Current Topics in Community Colleges**

(3-0) Cr. 3.

*Prereq: HG ED 582*

Current issues and new directions in community college practice, policy, and research.

**HG ED 581: Community College Partnerships**

(3-0) Cr. 3. S.

Overview of the community environment in which community colleges serve and the external groups with whom they partner, including environmental scanning, partner development, strategic planning, and maintaining relationships.

**HG ED 582: The Comprehensive Community College**

(3-0) Cr. 3.

*Prereq: Graduate classification*

The community college as a unique social and educational institution: its history, philosophy, functions, programs, faculty and student characteristics, organization and finance, trends, and issues. Reviews current research and exemplary community college practices internationally, nationally, and in Iowa.

**HG ED 590: Special Topics**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590A: Special Topics: Student Services**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590B: Special Topics: Community Colleges**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590C: Special Topics: Current Issues**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590D: Special Topics: International Higher Education**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590E: Special Topics: Federal and State Affairs**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590F: Special Topics: Law in Higher Education**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 590G: Special Topics: Institutional Research**

Cr. 1-4.

*Prereq: 9 credits in education*

Independent study on specific topics arranged with an instructor.

**HG ED 591: Supervised Field Experience**

Cr. 1-4. Repeatable.

*Prereq: 9 credits graduate work*

Supervised on-the-job field experience.

**HG ED 593: Workshops**

Cr. 1-5. Repeatable.

*Prereq: 15 credits in education*

**HG ED 598: Capstone Seminar**

(3-0) Cr. 3.

The primary goal of this course is for advanced students to demonstrate their preparedness to progress in the field of Student Affairs as educators who are able to apply concepts and formal (and informal) theories addressed in previous course and fieldwork to their professional student affairs thinking and practices.

**HG ED 599: Creative Component**

Cr. arr.

*Prereq: 9 credits in education*

**Courses for graduate students:****HG ED 615: Seminars in Higher Education**

Cr. 1-4.

**HG ED 615A: Seminars in Higher Education: Student Services**

Cr. 1-4.

**HG ED 615B: Seminars in Higher Education: Community Colleges**

Cr. 1-4.

**HG ED 615C: Seminars in Higher Education: Current Issues**

Cr. 1-4.

**HG ED 615D: Seminars in Higher Education: International Higher Education**

Cr. 1-4.

**HG ED 615E: Seminars in Higher Education: Federal and State Affairs**

Cr. 1-4.

**HG ED 615F: Seminars in Higher Education: Law in Higher Education**

Cr. 1-4.

**HG ED 615G: Seminars in Higher Education: Institutional Research**

Cr. 1-4.

**HG ED 615H: Seminars in Higher Education: Research Designs in Higher Education**

Cr. 1-4.

**HG ED 663: Community College Students**

(3-0) Cr. 3.

*Prereq: Graduate student classification*

Comprehensive understanding of students in American community colleges while enhancing research skills and a scholar-practitioner approach to working with students. Examine the curricula in place that serve a diverse student population with different educational objectives. Examine student types found in comprehensive community colleges including transfer, career & technical, adult basic education, and English language learners.

**HG ED 664: College Organization and Administration**

(3-0) Cr. 3.

Examination of administrative organization and behavior using theories and lenses to understand topics such as: communications, leadership, resource allocation, strategic planning, and institutional governance.

**HG ED 665: Financing Higher Education**

(3-0) Cr. 3.

Lectures, discussions, and individual investigation relating to financial administration in colleges and universities. Budgeting, auxiliary enterprises, administration of financial planning, fund raising, examination of theories on expenditures. Designed for persons aspiring to serve as college administrators.

**HG ED 666: Academic Issues and Cultures**

(3-0) Cr. 3.

Examination of institutional culture and issues in higher education focusing on the roles and responsibilities of faculty and academic administrators.

**HG ED 667: Leadership & Change in Community Colleges**

(3-0) Cr. 3. SS.

*Prereq: Admission to Ed.D. emphasis in Community College Leadership*

An examination of advanced community college leadership practice. Team-based leadership, leadership strategies, planning, and change.

**HG ED 668: Workforce, Economic & Community Development in Community Colleges**

(3-0) Cr. 3. S.

*Prereq: Admission to the Ed.D. in Education program*

This course provides an overview of how community colleges influence workforce, economic, and community development through their education missions.

**HG ED 673: Diversity and Inclusion in Higher Education**

(3-0) Cr. 3.

*Prereq: Graduate student classification*

Critical understanding of issues of diversity and inclusion in higher education. There are multiple dimensions to diversity and inclusion, far too complicated to cover in one course. Therefore, the goal of this seminar is to provide a general understanding of theory, research, and practices related to diversity and inclusion issues. Considers intersectional perspectives of diversity and inclusion within higher education.

**HG ED 676: Student Development Theory II**

(3-0) Cr. 3.

*Prereq: HG ED 576*

An examination of social identity theories including those exploring race, ethnicity, gender, class, ability, sexuality, and spirituality. An exploration of how social identity is influenced by the dynamics of power and oppression in education and society and how to enhance the college experiences of students from diverse backgrounds.

**HG ED 690: Advanced Special Topics**

Cr. 1-4. Repeatable.

*Prereq: 9 credits in education***HG ED 699: Research**

Cr. arr. Repeatable.

*Prereq: 9 credits in education*

## History (HIST)

***Any experimental courses offered by HIST can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****HIST 195: Introduction to History**

(1-0) Cr. 1.

Introduction to the discipline of history and how historians think and work. Focus on research methodologies, writing and analytical practices of historians, and specialization in the discipline.

**HIST 201: Introduction to Western Civilization I**

(3-0) Cr. 3. F.

Western civilization from ancient Mediterranean world to 1500. Social and cultural developments; economic and political ideas and institutions; problems of historical change and continuity. Meets International Perspectives Requirement.

**HIST 202: Introduction to Western Civilization II**

(3-0) Cr. 3. S.

Western civilization from 1500 to present. Social and cultural developments; economic and political ideas and institutions; problems of historical change and continuity.

Meets International Perspectives Requirement.

**HIST 207: Chinese Civilization**

(3-0) Cr. 3.

Origins, development, decline and transformation of China from earliest times to 1911.

Meets International Perspectives Requirement.

**HIST 211: Ancient Empires: From Sargon to Caesar**

Cr. 3. F.S.

Development of empires in the Near East and Mediterranean from the Akkadians to the fall of Rome. Discussion of the Hittites, Assyrians, Persians, Athenians, Macedonians (including the conquests of Alexander the Great), Carthaginians, and Romans; examination of imperialism as well as the social, cultural, and economic consequences of empire.

Meets International Perspectives Requirement.

**HIST 212: Medieval Kingdoms**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of political, social, and cultural developments in western Europe for the entire medieval period, 300-1500.

**HIST 221: Survey of United States History I**

(3-0) Cr. 3. F.

Colonial foundations: revolution, confederation, and constitution; nationalism and democracy; sectional disunity, Civil War, and reunion.

**HIST 222: Survey of United States History II**

(3-0) Cr. 3. S.

Industrialization; emergence as a great power; boom and depression; war, internationalism and Cold War; modern industrial society.

**HIST 255: Introduction to World History, 1500-Present**

(3-0) Cr. 3.

*Prereq: None*

Social and cultural developments; economic and political ideas and institutions; colonization of the Americas; biological exchanges; industrialization; political revolutions; European colonialism; emergence of the Global South; Cold War; decolonization; fossil fuels and energy; global environmental change.

Meets International Perspectives Requirement.

**HIST 271: The History of Sports in the United States**

Cr. 3. S.

Professionalization of sports from their origins as invented recreational activities to their present status as fiscally privileged, legally protected cultural icons. Covering the period from the 17th to the end of the 20th century.

**HIST 280: Introduction to History of Science I**

(3-0) Cr. 3.

Ideas of nature from ancient Greece to the seventeenth-century scientific revolution.

Meets International Perspectives Requirement.

**HIST 281: Introduction to History of Science II**

(3-0) Cr. 3.

Science from seventeenth-century scientific revolution to Darwin and Einstein.

Meets International Perspectives Requirement.

**HIST 284: Wonders of the World, Global History of Innovation**

(3-0) Cr. 3. F.

Innovation across cultures from the ancient "Seven Wonders of the World" to the modern world, with developments in Egypt, Greece, Rome, the Islamic World, India, China, Europe, and the Americas.

Topics include major inventions, agricultural technologies, architecture, manufacturing, warfare, engineering, printing, entertainment, transport, and communications.

Meets International Perspectives Requirement.

**HIST 301: The Historian's Toolbox**

(3-0) Cr. 3. F.S.

*Prereq: History major; Sophomore classification*

Foundations of the discipline with emphasis on the purpose, practice, and methodology of History. Required of majors.

**HIST 304: Cultural Heritage of the Ancient World**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Historical examination of art, literature, thought, and religious beliefs of major civilizations of the ancient Mediterranean countries until the end of the 8th century.

**HIST 307: American Popular Culture**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Social practices, beliefs and material traits of everyday life in America from the mid-19th century to the present. Includes literature, music, theater and other entertainments. Dime novels, vaudeville, rock and roll music, Hollywood and establishment of professional athletic leagues are among the cultural artifacts and phenomena considered.

**HIST 310: Africa to 1880**

(Cross-listed with AF AM). Cr. 3.

*Prereq: Sophomore classification*

Survey of the history of African societies, cultures and civilizations from earliest times to 1880. Evolution of states across the continent; social, economic, political, and cultural developments; nature and consequences of African interactions and relationship with Europeans.

Meets International Perspectives Requirement.

**HIST 311: Africa under Colonial Rule**

(Cross-listed with AF AM). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Development of Africa from imposition of colonial rule to independence, including processes of European domination, African reaction and resistance, emergence of nationalism, and dismantling of colonialism.

Meets International Perspectives Requirement.

**HIST 318: History of Early Modern Europe, 1450-1789**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of major themes in the social, political, cultural, and religious history of early modern Europe, including the eras of renaissance and reformation, the age of exploration, development of the modern individual and household, and enlightenment.

**HIST 320: History of Modern Europe, 1789 to Present**

(3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Survey of major themes in the social, political, and religious history of Europe from the French Revolution to the present. Topics to be covered include the French Revolution, nationalism, the Industrial Revolution, the Russian Revolution, World Wars I and II, the Cold War, the fall of the Soviet Union, and the history of globalization.

**HIST 325: Society and Politics in England, 1525-1700**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Social, cultural, demographic, and economic experiences. Religious Reformation. Growth of the State (and Empire) and political institutions.

**HIST 327: History of the British Empire**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Development of British Empire from origins in the seventeenth century to dissolution in the twentieth century. Attention given to empire in S. Pacific, N. America, India and S. Asia, Hong Kong, Africa and the Middle East, as well as theories of empire and the impact of immigration on British society. Irish history also covered. none

Meets International Perspectives Requirement.

**HIST 331: History of the Islamic World to 1800**

(3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Survey of the Islamic world from pre-Islamic Arabia to the 19th century covering the life of the Prophet Muhammad, the spread of Islam through the Arab conquests and the Caliphal dynasties of the Umayyads and the Abbasids, the Mongol conquests, Turkic migrations from Central Asia, and the rise of the Ottoman Empire.

**HIST 336: History of Modern China I**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

China from 1644 to 1912; internal and external stimuli on traditional structure leading to reform and revolution.

Meets International Perspectives Requirement.

**HIST 337: History of Modern China II**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

China from 1912 to present; search for a new order and continuing Chinese revolution.

Meets International Perspectives Requirement.

**HIST 339: US-Asian Relations**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of US-East Asian (Japan, China, Korea) relations from the late 18th century to the end of the Cold War.

Meets International Perspectives Requirement.

**HIST 340: History of Latin America I**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Colonial Latin America from European discovery and colonization to wars for independence.

**HIST 341: History of Latin America II**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Modern Latin America national origins from 1800 to present.

Meets International Perspectives Requirement.

**HIST 353: History of African Americans I**

(Cross-listed with AF AM). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Examines African roots of black culture and the African American experience in the United States from the colonial period through the Civil War. Topics include Atlantic Slave Trade, slavery and American identity, abolition, the emergence of Black Nationalism, and black participation in the Civil War.

Meets U.S. Diversity Requirement

**HIST 354: History of African Americans II**

(Cross-listed with AF AM). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Explores African American political thought and political action from Reconstruction to the present. Topics include rise of Jim Crow segregation, urban migration, Garvey movement, Harlem Renaissance, Depression and world wars, Pan-Africanism, civil rights, Black Power, and black feminism.

Meets U.S. Diversity Requirement

**HIST 357: American Family History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

The impact on American families from colonial times onward of agricultural change, industrialization, urbanization, and wars and depressions.

**HIST 362: Global Environmental History**

(Cross-listed with ENV S). (3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Survey of the interactions of human communities with their environments from the beginnings of human history to the present. Topics include the domestication of animals, the agricultural revolution, industrialization, urbanization, deforestation, hydraulic management, fossil fuel consumption, and climate change.

**HIST 363: U. S. Environmental History**

(Cross-listed with ENV S). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of the interactions of human communities with the North American environment. Focus on the period from presettlement to the present, with a particular concentration on natural resources, disease, settlement patterns, land use, and conservation policies.

**HIST 364: The Mythic Wild West**

Cr. 3. Alt. SS., offered irregularly.

*Prereq: Sophomore classification*

Examination of the history of the mythic American West, including how people have thought about the region, the myths that emerged from the West, and the role the mythical West played in the formation of American identity.

**HIST 365: American Agriculture I: The Maya to McCormick's Reaper**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

North American agricultural development to 1865. American Indian agricultural systems, European background and agricultural revolution, agriculture in the colonial era, early republic and antebellum period. Topics include origins of modern crops, agriculture's role in the economy, politics, and settlement of the U.S., slavery, rural and frontier life, and mechanization.

**HIST 366: American Agriculture II: Homestead Act to GMOs**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

American agricultural development since 1865. Post-Civil War adjustments; westward expansion; economic boom and bust; mechanization; Dust Bowl and environmental challenges; Great Depression and New Deal; changing rural life; scientific and technological advances; farm crisis and late twentieth century challenges.

**HIST 367: America Eats**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Thematic approach to the development of the American agricultural system through the topics of food and eating. Changes in American food systems from Native American, pre-contact diets through modern innovations such as fast food, organics, and eating locally.

**HIST 370: History of Iowa**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of major social, cultural and economic developments in Iowa from the late 1700s. Emphasis on minority groups, pioneer life, early economic development, industrial development, educational and religious development, and outstanding personalities.



**HIST 371: Mexican American History**

(Cross-listed with US LS). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

History of the Mexican American community in the U.S. from the 1820s to the present. Topics include community development, employment, social marginalization, racism/discrimination, depression and world wars, civil rights, ethnic power and politics.

Meets U.S. Diversity Requirement

**HIST 372: Latina/o History**

(Cross-listed with US LS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Historical and cultural heritage of Latinas/os in the United States. The histories of Mexican, Puerto Rican, Cuban, and other Latin American peoples in the U.S. emphasizing political and cultural convergence and congruencies.

Meets U.S. Diversity Requirement

**HIST 374: Sex, Gender, and Culture in the Ancient Mediterranean World**

(Cross-listed with CL ST, WGS). (3-0) Cr. 3.

Survey of the roles of women and others on the margins and the issues that impacted them in the ancient Greek and Roman worlds. Evidence from literature, the visual arts, and archaeology. Contemporary approaches to studying women, gender, and sexuality in ancient history. Intersections of gender categories with ideas of slave and free status, citizenship, and ethnicity. Readings from ancient and modern sources. Meets International Perspectives Requirement.

**HIST 380: History of Women in Science, Technology, and Medicine**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

History of women's relationship to the fields of science, technology, and medicine, as students and professionals, consumers, subjects and patients, family members, workers and citizens. Concentrates especially on 19th and 20th century United States, concluding with an examination of current issues of special interest to women in science, technology, and medicine.

Meets U.S. Diversity Requirement

**HIST 382: History and Philosophy of the Scientific Revolution**

(Cross-listed with PHIL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 3 credits in PHIL or Permission of Instructor*

The emergence of empirical science as the authoritative methodology for production of knowledge about the natural world in the period between Copernicus and Kant. Scientific progress achieved during the period, including the work of Galileo, Descartes, and Newton. The re-shaping of epistemology in the Western intellectual tradition. Implications for philosophy and historiography.

**HIST 383: Technology, Public Science, and European Culture, 1715-Present**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

A survey from the Age of Enlightenment to the end of the twentieth century of the relationship between science, technology, and public or popular culture in a comparative European context (including Russia and the former Soviet Union).

Meets International Perspectives Requirement.

**HIST 384: Roman Italy: An Introduction**

(Cross-listed with CL ST). Cr. 2. Repeatable, maximum of 4 credits. S.

*Prereq: Permission of Instructor*

Introduction to the topography, history, archaeology, monuments, and art of Rome from the 8th century BCE to the 5th century CE; attention given to the culture of modern Italy, preparatory to study abroad in Rome. Enrollment limited to students participating in CL ST 385/HIST 385. Meets International Perspectives Requirement.

**HIST 385: Study Abroad: Roman Italy: Building the Empire**

(Cross-listed with CL ST). Cr. 3. Repeatable, maximum of 6 credits. SS.

*Prereq: CL ST 384 or HIST 384; Permission of Instructor*

Supervised on-site instruction in the history, archaeology, monuments, and art of Rome and environs from the 8th century BCE to the 5th century CE; attention given to the culture of modern Italy. Meets International Perspectives Requirement.

**HIST 386: History of Women in America**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

A survey of social, economic, and political aspects of women's role from colonial era to present; emphasis on employment, education, concepts of sexuality, and changing nature of the home.

Meets U.S. Diversity Requirement

**HIST 387: First Ladies in U.S. History**

(Cross-listed with POL S, WGS). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

Evolution of the role and office of the First Lady in U.S. history, including her political activism, social impact, and international influence. Analysis of the authority, intersectionality, and agency of First Ladies in the aggregate and exploration of how individual First Ladies have interpreted and adapted this unique public position.

**HIST 389: American Military History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

American military experience from the Pequot War to Vietnam, including King Philip's War, the French & Indian Wars, the American Revolution, the War of 1812, the Mexican-American War, the Civil War, the Spanish-American War, World Wars I & II, and the Korean War.

Meets International Perspectives Requirement.

**HIST 390: World Military History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Covers military history from the Napoleonic era through the mid- and late-19th century wars, the First and Second World Wars, and wars of national liberation and regional conflicts since 1945.

Meets International Perspectives Requirement.

**HIST 391: American Diplomatic History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

A study of US foreign relations during the twentieth century, including the rise to global power, the First World War, diplomacy during prosperity and depression, the Second World War, the Cold War, relations with Latin America, East and South Asia and Africa, the search for markets, and the perceptions of American foreign policy held by the US, its allies and adversaries, and others.

**HIST 396: Topics in History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Specialized topics in history; topics vary each time offered.

**HIST 396A: Topics in History: Europe**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history; topics vary each time offered.

**HIST 396B: Topics in History: U.S. and North America**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history; topics vary each time offered.

**HIST 396C: Topics in History: Global**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history; topics vary each time offered.

**HIST 402: Greek Civilization**

(Cross-listed with CL ST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Ancient Greece from the Bronze Age to the Hellenistic period; evolution of the Greek polis and its cultural contributions, with a particular emphasis on the writings of Herodotus and Thucydides.

**HIST 403: Roman Civilization**

(Cross-listed with CL ST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Ancient Rome from the Regal Period to the fall of the Western Empire; evolution of Roman institutions and Rome's cultural contributions studied through original sources.

**HIST 405: Transformations of the Early Medieval World**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Examines major political, religious, and cultural transformations in Western Europe and the Mediterranean, 300-1000. Major topics include the fall of Rome, rise of Christianity, Germanic kingdoms, and Carolingian empire.

**HIST 406: The Birth of Europe in the High Middle Ages**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Examines political, economic, religious, and cultural forms emerging in Europe, 1000-1300, that still characterize Western society to this day. Major topics include the medieval agricultural revolution, English and French monarchies, crisis of church and state, and growth of the papacy and personal religion.

**HIST 407: Crises of the Late Middle Ages**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Examines major political, economic, religious, and intellectual crises that beset Europe, 1300-1500, paving the way for early modernity. Major topics include Black Death, 100 Years War, papal schism, and origins of Renaissance and Reformation.

**HIST 410: The Holocaust in History**

(3-0) Cr. 3. S.

*Prereq: Sophomore classification*

Historical and historiographical coverage of the Holocaust. Actions of perpetrators, experiences of the murdered, and inaction or action of bystanders within global, European, German, and Jewish history. Topics include history, historical methods, and contemporary and historical commemoration of the Holocaust. Seminar discussion format. Meets International Perspectives Requirement.

**HIST 414: European Cultural and Intellectual History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

A study of the development of key themes in European thought: nature, man, God, society, history, and creativity from Rousseau to Post-Modernism.

**HIST 419: History of Modern France**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

From absolutism to revolution and the rise of modern democracy.

**HIST 420: France's Revolutionary Century, 1715-1815**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

An in-depth investigation of the French Revolution, its causes and consequences, beginning in the Ancien Regime and ending with the fall of Napoleon.

**HIST 421: History of Russia I**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Russia to 1850. Origins of Russian people; Byzantine influences; Mongol invasion; rise of Moscow; Westernization.

Meets International Perspectives Requirement.

**HIST 422: History of Russia II**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Russia since 1850. Reform and revolution; transformation of society; USSR as a world power; recent changes.

Meets International Perspectives Requirement.

**HIST 423: The Russian and Soviet Mind: Intellectual and Cultural Life, 1762-1991**

Cr. 3.

*Prereq: Sophomore Classification*

Russian intellectual history from the reign of Catherine the Great to the collapse of Communism. Discussion of Russian literary, philosophical and cultural trends in the nineteenth century and the relationship between intellectual & cultural figures and the Soviet state in the twentieth century.

**HIST 424: History of Modern Germany**

(3-0) Cr. 3.

*Prereq: Sophomore classification.*

Political, social, and cultural history of Germany from the 19th century to the present.

**HIST 427: Crime and Policing in England 1550-1850**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Course examines different forms and ideas of criminality and the nature and development of law enforcement in England between 1550 and 1856. Significant issues will include the nature of criminal records and statistics, the legal system, the politics of the law and its links with social relations, policing, female crime, juvenile delinquency, organized crime, riots, "social crime," and the treatment of crime in creative literary texts.

**HIST 428: Punishment, Mentalities, and Society in England, 1550-1868**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Explores the history of punishing criminals in England and shows how interdisciplinary perspectives, ideas, and practices of punishment are related to mentalities, and socio-economic change. Issues of significance examined: violence, civility, manners, madness, public punishment, execution, imprisonment, transportation, mercy, the rise of asylums, and penal reform.

**HIST 429: "Monstrous London": London's Histories 1500-1800**

(3-1) Cr. 3-4.

*Prereq: Sophomore classification*

Study of London's social, economic, cultural, political, and environmental history 1500-1800, using both quantitative and qualitative methods to examine contemporary and secondary sources. Course combines standard lecture and discussion format with one week of intensive study abroad for 4th hour of course credit.

**HIST 431: Modern England**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

England since 1850. Parliamentary and constitutional development; social reform and economic change; imperial Britain; welfare state. Meets International Perspectives Requirement.

**HIST 435: History of the Modern Middle East**

Cr. 3. S.

*Prereq: Sophomore classification.*

Ottoman and Qajar reform movements; constitutional revolutions; European legal imperialism; colonialism; World War I and the mandate system; Israeli-Palestinian conflict; Arab nationalism; the Islamic Revolution in Iran; Islamist movements; oil resources; terrorism; sectarianism.

Meets International Perspectives Requirement.

**HIST 441: History of Modern Mexico and Central America**

(3-0) Cr. 3.

*Prereq: Sophomore classification.*

Political, economic, and social development of Mexico and Central America in nineteenth and twentieth centuries.

**HIST 442: Rebellions and Revolutions in Latin America**

(3-0) Cr. 3.

*Prereq: Sophomore classification.*

Survey of rebellions, revolutionary movements, and social revolutions in the twentieth century, including Guatemalan, Cuban, Mexican, Chilean, and Nicaraguan cases.

Meets International Perspectives Requirement.

**HIST 449: US Gilded Age, 1877-1900**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Sophomore classification*

U.S. History from the end of Reconstruction to the turn of the twentieth century. Discussion of prominent themes, including the opening of the West, the emergence of big business, rapid urbanization, immigration, race relations, American imperialism, and social reform.

**HIST 450: Colonial America**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Exploration, colonization, and development of political, economic, religious, and cultural institutions of North American colonies before 1754. Topics also include social history, emergence of African-American slavery, relations with American Indians.

**HIST 451: American Revolutionary Era**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Participants, ideas, and events leading to independence and the foundation of the United States, 1754 to 1789. Topics include political, military, social, cultural history, also issues of gender and race relations.

**HIST 453: Law and Society in U.S. History: Crime, Race, Family, Work and Property**

(3-0) Cr. 3.

*Prereq: Sophomore classification.*

The development of both law and the legal system from colonial times to the present, highlighting their crucial role in aspects of American life such as marriage, family, employment, racial identification, and economic exchange. Topics will include important past legal disputes, the different levels of courts, the various actors in the legal process (e.g., police, prosecutors, prisoners, judges and juries), the relationship between the individuals and institutions that comprise the legal system.

**HIST 454: Early American Republic**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Examination of the United States from the Constitutional Convention up to the Mexican War. Topics include the Washington, Jefferson, and Jackson administrations, the War of 1812, slavery and the South, economic and social development, Westward expansion and reform.

**HIST 455: U.S. Civil War and Reconstruction Era**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Examination of the social and economic contradictions that led to Civil War and the reconstruction of American freedom and democracy. Topics include the Mexican War, sectional conflict and the crisis of disunion, economic, political and social aspects of civil war, emancipation, and reconstruction.

**HIST 457: History of American Sexualities**

(Cross-listed with WGS). Cr. 3.

*Prereq: Sophomore classification*

The social construction of American sexualities from the colonial era to the present with particular emphasis on how ideas about sex and sexuality have shaped American public life, including education, public policy, party politics, and racial justice.

**HIST 458: U.S. 1900 to 1945**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

America in transition and crisis: Progressivism, World War I, the twenties, the Great Depression, and World War II.

**HIST 459: U.S. 1945 to the Present**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Modern American history with an emphasis on political, socio-cultural, ethno-racial, and military history. Topics include the Cold War, the wars in Korea and Vietnam, civil rights and Black/ethnic Power, modern feminism, and the conservative movement.

**HIST 460: The Great Plains**

(3-0) Cr. 3.

*Prereq: Sophomore Classification*

History of the Great Plains from prehistoric period. Emphasis on agricultural and rural development, Native Americans, cattle ranching, land policy, agrarian reform movements and federal policy.

**HIST 461: The American South**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

History of the American South from colonial period to present. Emphasis on economic, social, and political change in this rural region.

**HIST 465: The American West**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

History of trans-Mississippi West from 1800 to present, concentrating on settlement and regional identity. Emphasis on the state, the environment, urbanization, agriculture, Native Americans, and minority communities.

**HIST 468: History of Rural America**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

History of rural America from the colonial period to the present. Emphasizes immigration, ethnicity, religion, social and cultural change, and agriculture in relation to rural settlement, institution building, demographic change, gender, class, and political and economic development.

**HIST 473: Civil Rights and Ethnic Power**

(Cross-listed with AF AM, US LS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Comparative history of the civil rights and ethnic power movements (African American, Chicano, American Indian, Puerto Rican, among others) in the U.S. from World War II to the present. Topics include institutional foundations, leadership, gender and racial dynamics, and the convergences and divergences of these differing ethnic struggles for rights.

Meets U.S. Diversity Requirement

**HIST 479: China and the Cold War**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Important events in China's Cold War involvement, connections between domestic and foreign affairs, factors and rationales in China's foreign policy making the relationship between China's Cold War experience and recent developments.

**HIST 480: Field Experience for Secondary Teaching Preparation**

Cr. 0.5-2. Repeatable, maximum of 2 times. F.S.

*Prereq: Permission of Area Coordinator*

Observation and participation in a variety of school settings after admission to the teacher preparation program. (S/F grading may be used in some offerings of some sections.).

**HIST 480A: Pre-Student Teaching Experience III: History/Social Sciences**

(Cross-listed with EDUC). Cr. 2. Repeatable, maximum of 2 times. F.

*Prereq: Admitted to Educator Preparation Program*

Supervised participation in a 5-12 school setting. Permission of History/Social Sciences coordinator required prior to enrollment. Two, half-days per week needed for school experience. Clinical Supervision Level 3.

**HIST 481: Public History**

Cr. 3. Repeatable, maximum of 1 times. F.

*Prereq: Sophomore classification.*

Development of theories and methods in the field of public history. Emphasis on practical applications such as archival research, museum interpretation, historic preservation, and oral history within the context of United States history. None

**HIST 482: Birth, Death, Medicine, and Disease**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

History of medicine, sickness, and public health from ancient times to the twenty-first century in the US, Europe, and around the world. Topics include changing ideas of health and illness, development of doctors and hospitals, social and ethical issues in health care, and epidemics from cholera to AIDS.

**HIST 488: American Stuff, Colonial Times to the Present**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Inventions, innovations, artifacts, and material culture in the United States, from homespun cloth and the Colt revolver, through the transcontinental railroad and Model T, to fast food and the iPhone.

**HIST 489: The World at War**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq: Sophomore standing*

In-depth exploration of a particular global conflict (topic varies; e.g., the French and Indian War, the Napoleonic Wars, World War I, World War II, the Vietnam War, and post-Cold War U.S. overseas conflicts) by focusing on multiple aspects of that conflict such as belligerents' justification, diplomacy, manpower policy, technology, strategies and tactics, morality, protest, civilian and military experiences, gender roles, the aftermath of conflict, and collective memory and memorialization.

**HIST 490: Independent Study**

(3-0) Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

Reading and reports on problems selected in conference with each student. No more than 6 credits of Hist 490 may be counted toward graduation with a major in History. No credits of Hist 490 may count toward a minor in History.

**HIST 495: Historiography and Research Writing**

(3-0) Cr. 3. F.S.

*Prereq: HIST major; HIST 301; 9 or more additional credits of 300- or 400-level HIST*

Variable topics seminar that focuses on historiographical and research skills and writing. Required of majors.

**HIST 496: Advanced Topics in History**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Specialized topics in history, topics vary each time offered.

**HIST 496A: Advanced Topics in History: Europe**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history, topics vary each time offered.

**HIST 496B: Advanced Topics in History: U.S. and North America**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history, topics vary each time offered.

**HIST 496C: Advanced Topics in History: Global**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Sophomore classification*

Specialized topics in history, topics vary each time offered.

**HIST 498: Methods of Teaching History/Social Sciences**

(Dual-listed with HIST 598). (Cross-listed with EDUC). (3-0) Cr. 3. F.S.

*Prereq: Concurrent enrollment in HIST 480A; admission to Educator Preparation Program*

Theories and processes of teaching and learning secondary history/social sciences. Emphasis on development and enactment of current methods, assessments, and curriculum materials for providing appropriate learning experiences.

**Courses primarily for graduate students, open to qualified undergraduates:**

**HIST 510: Readings Seminar in East Asian History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in East Asian history. Topics vary each time offered.

**HIST 511: Readings Seminar in American History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511A: Readings Seminar in American History: Colonial Period**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511B: Readings Seminar in American History: Nineteenth Century**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511C: Readings Seminar in American History: Twentieth Century**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511E: Readings Seminar in American History: Social and Cultural**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511F: Readings Seminar in American History: West**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 511G: Readings Seminar in American History: The South**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American history. Topics vary each time offered.

**HIST 512: Readings Seminar in European History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European history.

**HIST 512A: Readings Seminar in European History: Ancient**

(Cross-listed with CL ST). (3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European history.

**HIST 512B: Readings Seminar in European History: Medieval and Early Modern**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European history.

**HIST 512C: Readings Seminar in European History: Modern**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European history.



**HIST 513: Readings Seminar in Latin American History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in Latin American history. Topics vary each time offered.

**HIST 530: Readings Seminar in Modern Russian/Soviet History**

(3-0) Cr. 3. Repeatable.

*Prereq: HIST 422*

Readings in modern Russian history. Topics vary each time offered.

**HIST 550: Readings Seminar in European Rural and Agricultural History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in European rural and agricultural history. Topics vary each time taught.

**HIST 552: Readings Seminar in American Rural and Agricultural History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American rural and agricultural history. Topics vary each time taught.

**HIST 552A: Readings Seminar in American Rural and Agricultural History: American Agriculture**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in American agricultural history. Topics vary each time taught.

**HIST 552B: Readings Seminar in American Rural and Agricultural History: Agrarian Reform Movements**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings on American agrarian reform movements. Topics vary each time taught.

**HIST 552C: Readings Seminar in American Rural and Agricultural History: Midwestern Rural Society**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings on American Midwestern rural society. Topics vary each time taught.

**HIST 552D: Readings Seminar in American Rural and Agricultural History: Women in Rural Life**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings on American women and rural life. Topics vary each time taught.

**HIST 554: Readings Seminar in Environmental History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor.*

Readings in environmental history. Topics vary each time offered.

**HIST 554A: Readings Seminar in Environmental History: American**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor.*

Readings in American environmental history. Topics vary each time offered.

**HIST 554B: Readings Seminar in Environmental History: European**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor.*

Readings in European environmental history. Topics vary each time taught.

**HIST 554C: Readings Seminar in Environmental History: Global**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of Instructor*

Readings in global environmental history. Topics vary each time taught.

**HIST 575: Readings Seminar in the History of Technology**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Readings in the history of technology. Topics vary each time taught.

**HIST 583: Historical Methods**

(3-0) Cr. 3.

Study of evidence, theory, and methods.

**HIST 583A: Historical Methods: Narrative**

(3-0) Cr. 3.

*Prereq: Permission of instructor.*

Study of the methodologies of historical narrative.

**HIST 583B: Historical Methods: Statistical Evidence and Analysis**

(3-0) Cr. 3.

*Prereq: Permission of instructor.*

Study of methodologies of using statistical evidence in writing history.

**HIST 583C: Historical Methods: Issues in Historiography**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Permission of instructor.*

Study of issues surrounding the development of historiography and historical theories.

**HIST 585: Teaching Methods for the Modern Europe Survey**

(2-2) Cr. 3. S.

*Prereq: Graduate status or instructor approval.*

Pedagogy and historiography of Europe, from the Protestant Reformation to the present. Pedagogical topics covered include general principles of survey-course construction, lecture technique, and textbook evaluation; historiographical topics will include the Reformation, the Enlightenment, the Industrial Revolution, the French Revolution, the rise of Nationalism, imperialism, the two World Wars, the Cold War and decolonization.

**HIST 586: Readings Seminar in Women's and Gender History**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: Permission of instructor*

Readings in women's and gender history.

**HIST 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**HIST 591: Directed Readings in History**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Doctoral student in RATE program*

Individually directed readings in History for doctoral students preparing for preliminary examinations in Rural, Agricultural, Technological and Environmental History (RATE). Only 9 credits of HIST 591 may count toward graduation.

**HIST 593: Research Seminar in American History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 593A: Research Seminar in American History: Colonial Period**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 593B: Research Seminar in American History: Nineteenth Century**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 593C: Research Seminar in American History: Twentieth Century**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 593F: Research Seminar in American History: West**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 594: Research Seminar in European History**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 594A: Research Seminar in European History: Ancient**

(Cross-listed with CL ST). (3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 594B: Research Seminar in European History: Medieval and Early Modern**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 594C: Research Seminar in European History: Modern**

(3-0) Cr. 3. Repeatable.

*Prereq: Permission of instructor*

Topics vary each time offered.

**HIST 598: Methods of Teaching History/Social Sciences**

(Dual-listed with HIST 498). (3-0) Cr. 3. F.S.

*Prereq: Concurrent enrollment in HIST 480A; admission to Educator Preparation Program*

Theories and processes of teaching and learning secondary history/social sciences. Emphasis on development and enactment of current methods, assessments, and curriculum materials for providing appropriate learning experiences.

**HIST 599: Creative Component**

Cr. 1-6. Repeatable, maximum of 6 credits.

**Courses for graduate students:****HIST 610: Research Seminar in American Rural and Agricultural History**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Permission of instructor*

Emphasis varies each time offered.

**HIST 612: Research Seminar in Environmental History**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Permission of instructor.*

Emphasis varies each time offered.

**HIST 614: Research Seminar in the History of Technology**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: Permission of instructor.*

Emphasis varies each time offered.

**HIST 699: Research**

Cr. 1-6. Repeatable.

Graduate student thesis research.

## Honors (HON)

**Courses primarily for undergraduates:****HON 121: First-Year Honors Program Seminar**

(0-2) Cr. 1. F.

*Prereq: Membership in the First-Year Honors Program*

Orientation to Iowa State University and to the University Honors Program. Students will meet and work with other high-ability students for the purpose of exchanging ideas and considering alternative futures as a basis for launching personalized academic programs and professional careers. Offered on a satisfactory-fail basis only.

**HON 290: Special Problems**

Cr. arr.

*Prereq: Membership in the First-Year Honors Program*

Independent study on topics of an interdisciplinary nature. Intended primarily for freshmen and sophomores. Offered on a satisfactory-fail basis only.

**HON 290H: First-Year Honors Mentor Program**

Cr. 1-2. F.S.

*Prereq: Membership in the First-Year Honors Program*

Independent research study as a part of the First-Year Honors Mentor program (FHMP), which offers first-year honors students the opportunity to get research experiences with a faculty mentor. The main objectives of the FHMP are to develop students' interest in and understanding of academic research and to help them identify a research area for an honors capstone project. Offered on a satisfactory-fail basis only.

**HON 290U: Undergraduate Research**

Cr. arr. F.S.

*Prereq: Membership in the University Honors Program; Permission of the University Honors Program Director*

Independent study as a continuation of the First-Year Honors Mentor program (FHMP), which offers second-year honors students the opportunity to continue research experiences with the same FHMP faculty mentor as in the HON 290H course. The main objectives are to extend students' involvement in research and understanding of an academic field and to help them identify a research area for an honors capstone project. Offered on a satisfactory-fail basis only.

**HON 302: First-Year Honors Leadership Development**

(1-2) Cr. 2. F.

*Prereq: Permission of the Director for First-Year Honors Program*

For students serving as leaders of First-Year Honors Seminars, under faculty supervision. Development of teaching and leadership skills to augment the experiential education students are gaining by co-instructing Honors 121. Offered on a satisfactory-fail basis only.

**HON 321: University Honors Seminars**

Cr. 1-2. F.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 322: University Honors Seminars**

Cr. 1-2. S.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 323: University Honors Seminars**

Cr. 1-2. F.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 324: University Honors Seminars**

Cr. 1-2. S.

*Prereq: Membership in the University Honors Program*

Interdisciplinary seminars on topics to be announced in advance. Offered on a satisfactory-fail basis only.

**HON 490: Independent Study**

Cr. arr. Repeatable. F.S.

*Prereq: Membership in the University Honors Program; Permission of the University Honors Program Director*

Independent study on topics of an interdisciplinary nature. Intended primarily for juniors and seniors.

## Horticulture (HORT)

***Any experimental courses offered by HORT can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**HORT 110: Professional and Educational Development in Horticulture.**

(1-0) Cr. 1. F.

Intended for first-year students and others new to the horticulture curriculum. Introduction to professional and educational development within horticulture. Focus is on university and career acclimation. Assessed service-learning component.

**HORT 121: Home Horticulture**

(3-0) Cr. 3. F.S.

Growing plants in and around the home including requirements for growing indoor plants, plant propagation, landscape design, and maintaining trees, lawns, flower, fruit, and vegetable gardens. Recitation includes demonstrations and hands-on activities that illustrate principles of designing, growing and maintaining plants for both indoor and outdoor gardens.

**HORT 131: Floral Design**

(1-2) Cr. 2. F.S.

Introduces basic geometric design of fresh arrangements, corsages, and holiday arrangements. Includes use of tools and supplies.

**HORT 132: Wedding and Event Floral Design**

(1-2) Cr. 2. F.S.

*Prereq: HORT 131*

Principles of design and proper mechanics for ceremony flowers, reception flowers, personal flowers, bridal bouquets, and event florals. Flower and plant materials that are commonly used in the event industry. Plan, design, cost, order, and create florals for a wedding, then present as the final project for implementation.

**HORT 193: Topics in Horticulture**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193A: Topics in Horticulture: Greenhouse Crops**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193B: Topics in Horticulture: Nursery Crops**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193C: Topics in Horticulture: Turfgrass**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193D: Topics in Horticulture: Fruit Crops**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193E: Topics in Horticulture: Vegetable Crops**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193F: Topics in Horticulture: Cross-Commodity**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 193G: Topics in Horticulture: Landscape Horticulture**

Cr. arr. Repeatable. F.S.SS.

Practical courses in the field of horticulture. A maximum of 6 credits of Hort 193 may be used toward the total of 128 credits required for graduation.

**HORT 221: Principles of Horticulture Science**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in BIOL 211*

Biological principles of growing horticultural crops including anatomy, reproduction, light, temperature, water, nutrition, and growth and development. Laboratory exercises emphasize environmental factors and permit detailed observation of plant growth.

**HORT 233: House Plants and Interiorscaping**

(1-2) Cr. 2. F.S.

Basic introduction to indoor houseplants and interiorscapes. Understand plant selection, identification, maintenance, and problem solving. Learn current houseplant trends, commercial interior plant design, and installation. A beneficial course for students with an interest in house plants, retail plant sales, Interiorscaping, event design, or gardening.

**HORT 240: Trees, Shrubs, and Woody Vines for Landscaping**

(2-3) Cr. 3. F.

Identification of trees, shrubs, and woody vines. Factors influencing the horticultural use of woody plants. Field trips outside of regular class time may be required.

**HORT 276: Understanding Grape and Wine Science**

(Cross-listed with FS HN). (2-2) Cr. 3. S.

A scientific introduction to viticulture (grape-growing) and enology (wine-making) and grape and wine chemistry. Topics include grape biology and cultivars, vineyard management, geography of wine, wine production, wine classification, grape and wine chemistry, wine sensory. No wine tasting.

**HORT 281: Landscape Graphics**

(0-4) Cr. 2. F.

Introduction to computer and hand rendering techniques of landscape graphics. Students will gain proficiency in plan view and elevation graphics. Intensive studio and computer based instruction.

**HORT 283: Pesticide Application Certification**

(Cross-listed with AGRON, ENT, FOR). (2-0) Cr. 2. S.

Core background and specialty topics in agricultural, and horticultural pesticide applicator certification. Students can select certification categories and have the opportunity to obtain pesticide applicator certification at the completion of the course. Commercial pesticide applicator certification is emphasized.

**HORT 291: Horticulture Professional Development**

Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Instructor*

Intensive training in preparation for intercollegiate competition in turfgrass, planting, design, plant identification, installation, cost estimating, and other skills at national contests in horticulture. Students must compete in related national competition to earn credit. Offered on a satisfactory-fail basis only. Only one credit of HORT 291A, 291B, or 291C may count toward Horticulture credits for graduation. A maximum of four credits of any combination of HORT 291A, 291B, and 291C may count toward credits for graduation.

**HORT 291A: Horticulture Professional Development: Turfgrass Competition**

(0-2) Cr. 1. Repeatable, maximum of 4 credits. F.

*Prereq: Permission of Instructor*

Intensive training in preparation for intercollegiate competition in turfgrass, planting, design, plant identification, installation, cost estimating, and other skills at national contests in horticulture. Students must compete in related national competition to earn credit. Offered on a satisfactory-fail basis only. Only one credit of HORT 291A, 291B, or 291C may count toward Horticulture credits for graduation. A maximum of four credits of any combination of HORT 291A, 291B, and 291C may count toward credits for graduation.

**HORT 291B: Horticulture Professional Development: Landscape Competition**

(1-0) Cr. 1. Repeatable, maximum of 4 credits. S.

*Prereq: Permission of Instructor*

Intensive training in preparation for intercollegiate competition in planting, design, plant identification, installation, cost estimating, and other skills at national contests in horticulture. Students must compete in related national competition to earn credit. Offered on a satisfactory-fail basis only. Only one credit of HORT 291A, 291B, or 291C may count toward Horticulture credits for graduation. A maximum of four credits of any combination of HORT 291A, 291B, and 291C may count toward credits for graduation.

**HORT 291C: Horticulture Professional Development: Cross-Commodity**

(0-2) Cr. 1. Repeatable, maximum of 4 credits. F.S.

*Prereq: Permission of Instructor*

Intensive training in preparation for intercollegiate competition in planting, plant identification and other skills at national contests in horticulture. Students must compete in related national competition to earn credit. Offered on a satisfactory-fail basis only. Only one credit of HORT 291A, 291B, or 291C may count toward Horticulture credits for graduation. A maximum of four credits of any combination of HORT 291A, 291B, and 291C may count toward credits for graduation.

**HORT 321: Horticulture Physiology**

(3-0) Cr. 3. F.

*Prereq: BIOL 211 or HORT 221*

Principles of plant physiology relating to growth and development of horticultural plants including plant water relations, membrane transport, photosynthesis, photomorphogenesis, respiration, and phytohormones. Emphasis on plant's responses to environmental factors (temperature, water, and light) including cellular and whole-plant physiology under stressful environments.

**HORT 322: Plant Propagation**

(2-2) Cr. 3. S.

*Prereq: BIOL 211 or HORT 221*

Fundamental principles underlying sexual and asexual propagation of plants; practice in reproducing plants by use of seeds, cuttings, layering, grafting and budding and tissue culture.

**HORT 330: Herbaceous Ornamental Plants**

(2-2) Cr. 3. F.

*Prereq: HORT 221 or Permission of Instructor*

Identification, botanical characteristics, origins, propagation, uses and general culture of herbaceous annual and perennial plants for Midwestern gardens and landscapes.

**HORT 331: Hydroponic Crop Production**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: AGRON 181 or HORT 221 or 3 credits in Biological Sciences*

Principles and practices of hydroponic systems, crop production and culture, aquaponic systems, and new food and medicinal crops for hydroponic systems.

**HORT 332: Greenhouse and Nursery Operations and Management**

(3-3) Cr. 4. S.

*Prereq: HORT 221*

Operation and management of greenhouses, nurseries, and other controlled environment agriculture structures and facilities. Principle of site selection, facility design and methods of monitoring and manipulating environmental, cultural, and management factors such as light, temperature, fertility, substrate, etc., to maximize production efficiency. Emphasis placed on the principles of production of both ornamental and food crops. Greenhouse analysis project required.

**HORT 338: Seed Science and Technology**

(Cross-listed with AGRON). (2-3) Cr. 3. F.

*Prereq: (AGRON 181 or HORT 221); 3 credits of BIOL*

Seed production, maturation, dormancy, vigor, deterioration, and related aspects of enhancement, conditioning, storage, and quality evaluation. Aspects of the seed industry and regulation of seed marketing.

**HORT 341: Woody Plant Cultivars: Shade Trees, Ornamental Trees and Woody Shrubs**

(2-0) Cr. 2. S.

*Prereq: Hort 240 or L A 221 or L A 222*

Cultivars of the most prevalent and economically important woody landscape plants will be taught. The importance of cultivars to the nursery and landscaping professions and suggestions for their proper usage will be discussed.

**HORT 342: Landscape Plant Installation, Establishment, and Management**

(2-3) Cr. 3. S.

*Prereq: HORT 240 or L A 221 or L A 222*

Principles and practices involved with the establishment and management of landscapes. Laboratory work involves site evaluation, installation techniques, postplant care, and management of established landscape plants.

**HORT 351: Turfgrass Establishment and Management**

(Cross-listed with AGRON). (3-0) Cr. 3. F.

*Prereq: AGRON 181 or BIOL 211 or HORT 221*

Principles and practices of turfgrass propagation, establishment, and management. Specialized practices relative to professional lawn care, golf courses, athletic fields, highway roadsides, and seed and sod production. The biology and control of turfgrass pests.

**HORT 351L: Turfgrass Establishment and Management Laboratory**

(Cross-listed with AGRON). (0-3) Cr. 1. F.

*Prereq: Credit or concurrent enrollment in HORT 351*

Those enrolled in the horticulture curriculum are required to take 351L in conjunction with 351 except by permission of the instructor.

**HORT 354: Soils and Plant Growth**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

*Prereq: AGRON 182; 3 credits of BIOL*

Effects of chemical, physical, and biological properties of soils on plant growth, with emphasis on nutritive elements, pH, organic matter maintenance, and rooting development.

**HORT 354L: Soils and Plant Growth Laboratory**

(Cross-listed with AGRON). (0-3) Cr. 1. F.S.

*Prereq: AGRON or HORT major; credit or concurrent enrollment in AGRON 354*

Laboratory exercises in soil testing that assess a soil's ability to support nutritive requirements for plant growth.

**HORT 376: Fundamentals of Field Production of Horticultural Food Crops**

(3-0) Cr. 3. F.

*Prereq: AGRON 181 or HORT 221*

An introduction to field production of fruit and vegetable crops and the theoretical and practical knowledge required for successfully producing them. Topics will include basic principles and practices of fruit and vegetable production, site selection, soil techniques, irrigation management, equipment and tools, integrated pest management, season extension strategies, postharvest handling and food safety, marketing, and basic business planning for fruit and vegetable enterprises. Additionally, this course will prepare students for HORT 461 and HORT 471, that are advanced level courses focusing on fruit and vegetable production.

**HORT 380: Principles of Garden Composition**

(2-0) Cr. 2. S.

Functional and aesthetic aspects of landscape planning as a basis for design decisions; emphasis on spatial design and plant selection. Includes site analysis, design process, and design principles.

**HORT 381: Beginning Garden Composition Studio**

(0-4) Cr. 2. S.

*Prereq: HORT 281; (HORT 240 or HORT 330); concurrent enrollment in HORT 380*

Introduction to landscape design process. Intensive studio-based projects implementing principles of landscape design, concept development, and graphic communication.



**HORT 391: Horticultural Management Experience**

Cr. 1. Repeatable. F.S.SS.

*Prereq: HORT 221; Department Permission*

A structured work experience for the student to gain insight into management operations associated with production and management of horticultural crops. A report of 10 or more pages describing the student's experience is required. One credit is given for each term the student is enrolled in the course. A maximum of two credits may be used toward the horticultural sciences course requirements, and two additional credits may be used toward the 128 credits required for graduation.

**HORT 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Department Permission*

Students must register for this course before commencing each work period.

**HORT 421: Introduction to Plant Breeding**

(Cross-listed with AGRON). (3-0) Cr. 3. F.

*Prereq: BIOL 313 or GEN 320*

Fundamental principles of plant breeding and cultivar development, breeding methods for self-pollinated, cross-pollinated and clonal crops.

**HORT 424: Sustainable and Environmental Horticulture Systems**

(Dual-listed with HORT 524). (Cross-listed with ENV S). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Inquiry into ethical issues and environmental consequences of horticultural cropping systems, production practices and managed landscapes. Emphasis on systems that are resource efficient, environmentally sound, socially acceptable, and profitable.

**HORT 434: Floriculture Crop Production**

(2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: HORT 332*

Principles and practices of flowering and ornamental greenhouse crop production. Emphasis is placed on production of flowering potted plants, cut flowers, and foliage crops produced in greenhouses and other controlled environments. An overnight class field trip outside scheduled class time is required.

**HORT 435: Landscape Plant Production**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HORT 332*

Principles and practices of producing herbaceous and woody landscape plants for gardens, landscapes, restoration and other outdoor uses. Emphasis is placed on the production of: seedling plugs and rooted cuttings; container grown herbaceous annual and perennials; trees, shrubs, and vines; and native plants. An overnight class field trip outside scheduled class time is required.

**HORT 444: Landscape Construction Management**

(2-3) Cr. 3. F.

Principles and practices of residential landscape construction.

Encompasses project management, landscape estimating and overview of common landscape materials. Laboratory work involves field trips and project installation.

**HORT 451: Professional Turfgrass Management**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: HORT 351*

Turfgrass science including the study of (1) specific information on soil chemistry and soil modification as they relate to the development and maintenance of turfgrass areas, (2) specialized management practices used in athletic field care, professional lawn care, and golf course industries, and (3) construction methods for golf courses and sports fields.

**HORT 453: Sports Turf Management**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: HORT 351*

Management techniques for today's specialized athletic fields. The horticultural and budgetary aspects of football, soccer, baseball, and softball fields will be presented. Field trips and laboratory exercises will develop a practical understanding of actual principles in field development, construction, and management.

**HORT 454: Turf & Landscape Irrigation**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

Irrigation systems and principles for turf and landscape environments. Topics include design, installation, equipment, management, and trouble shooting of irrigation systems for golf, athletic fields, residential lawns and landscapes. Participation in practical exercises and local field trips to irrigation sites is required.

**HORT 461: Fruit Crop Production and Management**

(2-2) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HORT 221*

Principles and practices of small fruit, tree fruit, and nut culture and production. Morphology, physiology of growth and development, plant establishment, pest management, pruning, training, harvesting, storage, and marketing of commercial temperate fruit and nut crops. Emphasis on sustainable practices. Participation in practical exercises and local field trips is required.

**HORT 471: Vegetable Production and Management**

(Dual-listed with HORT 571). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq:* HORT 221

Principles of vegetable production with emphasis on sustainable production practices, market outlets, business aspects, and risk management. Topics will include crop classification and rotation; planting methods; crop climatic conditions, physiological growth & development; soil, water, and pest management; cover cropping; season extension strategies; harvest and postharvest management and marketing. Involves visits to growers fields to observe/experience their production enterprise.

**HORT 471L: Vegetable Production and Management Lab**

(Dual-listed with HORT 571L). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq:* Junior or Senior classification; concurrent enrollment in HORT 471

Hands-on training in the area of vegetable crop production. Opportunity to grow a variety of vegetables in a heated greenhouse and also conduct greenhouse and lab experiments. The lab also involves visits to vegetable production sites in Iowa to observe/experience and learn from growers and other agricultural professionals.

**HORT 475: Urban Forestry**

(Cross-listed with FOR). (2-3) Cr. 3. F.

*Prereq:* Junior or Senior classification; 3 credits in BIOL

Discussion of establishment and management of woody perennials in community-owned urban greenspaces, consideration of urban site and soil characteristics, plant physiology, plant culture, urban forest valuation, inventory methods, species selection, and urban forest maintenance (health care and pest management).

**HORT 476: Horticultural Postharvest Technology**

(Dual-listed with HORT 576). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* HORT 221

Study of pre- and post-harvest factors, procedures, and challenges that affect market quality of horticultural commodities. Emphasis on storage and handling technologies to preserve quality and extend storage life of edible and ornamental horticultural crops. Field trips outside scheduled class time required.

**HORT 481: Advanced Garden Composition**

(0-4) Cr. 2. F.

*Prereq:* HORT 240; HORT 330; HORT 380; HORT 381

Priority given to Landscape Design Installation and Management option students. Development of residential landscapes using design principles and the design process. Projects encompass site analysis, concept development, preliminary design, final design, and graphic presentation techniques. Techniques will include hand and computer rendering.

**HORT 484: Organic Agricultural Theory and Practice**

(Dual-listed with HORT 584). (Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* 9 credits in biological or physical sciences

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

**HORT 490: Independent Study**

Cr. arr. Repeatable.

*Prereq:* Junior or Senior classification in HORT; Permission of Instructor

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490A: Independent Study: Greenhouse Crops**

Cr. arr. Repeatable.

*Prereq:* Junior or Senior classification in HORT; Permission of Instructor

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490B: Independent Study: Nursery Crops**

Cr. arr. Repeatable.

*Prereq:* Junior or Senior classification in HORT; Permission of Instructor

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490C: Independent Study: Turfgrass**

Cr. arr. Repeatable.

*Prereq:* Junior or Senior classification in HORT; Permission of Instructor

Investigation of topic holding special interest to the student. Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490D: Independent Study: Fruit Crops**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490E: Independent Study: Vegetable Crops**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490F: Independent Study: Cross-Commodity**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490G: Independent Study: Landscape Horticulture**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490I: Independent Study: International Study**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 490J: Independent Study: Entrepreneurship**

Cr. arr. Repeatable.

*Prereq: Junior or Senior classification in HORT; Permission of Instructor*

Investigation of topic holding special interest to the student.

Comprehensive report required. Election of course and topic must be approved by department head. A maximum of 4 credits of HORT 490 and an additional 2 credits of 490 from outside Horticulture may be used toward the total of 129 credits required for graduation.

**HORT 491: Seed Science Internship Experience**

(Cross-listed with AGRON). Cr. 1-2. Repeatable, maximum of 1 times. F.S.SS.

*Prereq: AGRON 338; Permission of Instructor*

A professional work experience and creative project for seed science secondary majors. The project requires the prior approval and participation of the employer and instructor. The student must submit a written report. Advanced approval and participation of employer and instructor required.

**HORT 493: Workshop in Horticulture**

Cr. arr. Repeatable.

Off campus. Offered as demand warrants. Workshops in horticulture.

**HORT 494: Service Learning**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. Assessed service-learning component. A maximum of 4 credits of HORT 494 may be used toward the Horticulture credits required for graduation.

**HORT 494A: Service Learning: International**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. Assessed service-learning component. A maximum of 4 credits of HORT 494 may be used toward the Horticulture credits required for graduation.

**HORT 494B: Service Learning: Domestic**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of Instructor*

Selected projects that result in outcomes benefiting a non-Iowa State University entity while instilling professional ethics and accomplishing student learning goals. Course expenses paid by student. Assessed service-learning component. A maximum of 4 credits of HORT 494 may be used toward the Horticulture credits required for graduation.

**HORT 495: Horticulture Travel Course Preparation**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Students enrolled in this course also intend to register for Hort 496 the following term. Topics include preparation for safe international travel, the horticultural/agricultural industries, climate, crops, economics, geography, history, marketing, soils, culture, traditions, and horticultural/agricultural development of the country to be visited. Students enroll in this course the term immediately before travel to the foreign country.

**HORT 496: Horticulture Travel Course**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Limited enrollment. Study and tour of production methods in major horticultural regions of the world. Influence of climate, economics, geography, soils, landscapes, markets, cultures, and history of horticultural crops. Location and duration of tours will vary. Tour expenses paid by students.

Meets International Perspectives Requirement.

**Courses primarily for graduate students, open to qualified undergraduates:**

**HORT 506: Crop Genetics**

(Cross-listed with AGRON). Cr. 3. F.

Introduction to plant reproductive systems, gene segregation and linkage analysis, molecular nature of genes and how genes confer phenotypes, mutation and biotechnology, quantitative inheritance and population genetics to prepare students for subsequent courses in crop improvement. Enrollment is restricted to off-campus MS in Plant Breeding students.

**HORT 511: Integrated Management of Tropical Crops**

(Cross-listed with ENT, PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects.

Meets International Perspectives Requirement.

**HORT 524: Sustainable and Environmental Horticulture Systems**

(Dual-listed with HORT 424). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Inquiry into ethical issues and environmental consequences of horticultural cropping systems, production practices and managed landscapes. Emphasis on systems that are resource efficient, environmentally sound, socially acceptable, and profitable.

**HORT 530: Research Orientation**

(1-3) Cr. 2. F.

Instruction in scientific methods and communication skills.

**HORT 538: Seed Physiology and the Environment**

(Cross-listed with AGRON). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: AGRON 316; CHEM 231 or CHEM 331*

Physiological aspects of seed development, maturation, longevity, dormancy, and germination of agronomic and horticultural crops and their interactions with field and storage environments. Emphasis on current literature and advanced methodology.

**HORT 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**HORT 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**HORT 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**HORT 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**HORT 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**HORT 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**HORT 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**HORT 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, NREM, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**HORT 543: Seed Physiology**

(Cross-listed with STB). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Brief introduction to plant physiology. Physiological aspects of seed development, maturation, longevity, dormancy and germination. Links between physiology and seed quality.

**HORT 546: Strategies for Diversified Farming Systems**

(Cross-listed with AGRON, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: SusAg 509*

Project-focused engagement in food and farming systems using tools and perspectives drawn from multiple disciplines. Includes a field component.

**HORT 551: Growth and Development of Perennial Grasses**

(Cross-listed with AGRON). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Junior or senior or graduate classification or permission of instructor*

Selected topics on anatomy, morphology, and physiology relative to growth and development of perennial grasses. Emphasis on growth and development characteristics peculiar to grasses and variations of such characteristics under natural and managed conditions.

**HORT 571: Vegetable Production and Management**

(Dual-listed with HORT 471). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: HORT 221*

Principles of vegetable production with emphasis on sustainable production practices, market outlets, business aspects, and risk management. Topics will include crop classification and rotation; planting methods; crop climatic conditions, physiological growth & development; soil, water, and pest management; cover cropping; season extension strategies; harvest and postharvest management and marketing. Involves visits to growers fields to observe/experience their production enterprise.

**HORT 571L: Vegetable Production and Management Lab**

(Dual-listed with HORT 471L). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Junior or Senior classification; concurrent enrollment in HORT 471*

Hands-on training in the area of vegetable crop production. Opportunity to grow a variety of vegetables in a heated greenhouse and also conduct greenhouse and lab experiments. The lab also involves visits to vegetable production sites in Iowa to observe/experience and learn from growers and other agricultural professionals.

**HORT 576: Horticultural Postharvest Technology**

(Dual-listed with HORT 476). (2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: HORT 221*

Study of pre- and post-harvest factors, procedures, and challenges that affect market quality of horticultural commodities. Emphasis on storage and handling technologies to preserve quality and extend storage life of edible and ornamental horticultural crops. Field trips outside scheduled class time required.

**HORT 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with AGRON, ENT, PL P). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**HORT 584: Organic Agricultural Theory and Practice**

(Dual-listed with HORT 484). (Cross-listed with AGRON, SUSAG). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in biological or physical sciences*

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socio-economic processes and policies in organic agriculture from researcher and producer perspectives.

**HORT 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: a major or minor in horticulture*

**HORT 593: Workshop in Horticulture**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593A: Workshop in Horticulture: Greenhouse Crops**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593B: Workshop in Horticulture: Nursery Crops**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593C: Workshop in Horticulture: Turfgrass**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593D: Workshop in Horticulture: Fruit Crops**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593E: Workshop in Horticulture: Vegetable Crops**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593F: Workshop in Horticulture: Cross-Commodity**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 593G: Workshop in Horticulture: Landscape Horticulture**

Cr. arr. Repeatable.

Workshops in horticulture, with emphasis on off-campus instruction.

**HORT 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:****HORT 610: Graduate Seminar**

Cr. 1. Repeatable. F.S.

Offered on a satisfactory-fail basis only.

**HORT 690: Advanced Topics**

Cr. arr. Repeatable.

**HORT 696: Research Seminar**

(Cross-listed with AGRON, BBMB, FOR, GDCB, PLBIO). Cr. 1. Repeatable.

Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

**HORT 698: Horticulture Teaching Practicum**

(1-0) Cr. 1. S.

*Prereq: Graduate student classification*

Discussions are intended to foster the development of graduate students as teaching assistants and future horticulture/plant science teachers. Topics include establishing a classroom presence, improving lectures, motivating students, dealing with difficult or disruptive students, and developing a teaching philosophy. Offered on a satisfactory-fail basis only.

**HORT 699: Thesis and Dissertation Research**

Cr. arr. Repeatable.

**HORT 699A: Thesis and Dissertation Research: Greenhouse Crops**

Cr. arr. Repeatable.

**HORT 699B: Thesis and Dissertation Research: Nursery Crops**

Cr. arr. Repeatable.

**HORT 699C: Thesis and Dissertation Research: Turfgrass**

Cr. arr. Repeatable.

**HORT 699D: Thesis and Dissertation Research: Fruit Crops**

Cr. arr. Repeatable.

**HORT 699E: Thesis and Dissertation Research: Vegetable Crops**

Cr. arr. Repeatable.



**HORT 699F: Thesis and Dissertation Research: Cross-Commodity**

Cr. arr. Repeatable.

**HORT 699G: Thesis and Dissertation Research: Landscape Horticulture**

Cr. arr. Repeatable.

**HORT 699I: Thesis and Dissertation Research: Biotechnology**

Cr. arr. Repeatable.

## Hospitality Management (HSP M)

*Any experimental courses offered by HSP M can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**HSP M 101: Introduction to the Hospitality Industry**

(3-0) Cr. 3. F.S.

Introduction to the foodservice, lodging, and tourism components of the hospitality industry. Background information, current issues, and future challenges in various segments of the industry.

**HSP M 133: Food Safety Certification**

(1-0) Cr. 1. F.S.

Introduction to safety and sanitation principles in foodservice operations. Characteristics of food, supplies, and equipment as related to quality, sanitation, and safety are discussed. Application of sanitation principles in restaurants are covered as well. Students must pass a National Sanitation Certification Examination to receive credit. Offered on a satisfactory-fail basis only.

**HSP M 201: Casino Management I**

(3-0) Cr. 3. F.

An overview of the casino gaming industry. Emphasis will be placed on examination of the history and development of gaming, casino operations, casino games, marketing of the core gaming products, and social and economic impacts of the gaming industry.

**HSP M 225: Introduction to Food Service Operations**

(3-0) Cr. 3. S.

Introduction to food service operations within the hospitality and event industry. Management concepts, distinct features, sustainability, current issues, and trends.

**HSP M 230: Introduction to Hospitality Performance Analysis**

(3-0) Cr. 3. F.S.

Introduction to Uniform Systems of Accounts for hospitality industry, profitability, income statements, budgeting, managing cash, accounts receivable and payable, costs control, pricing, and evaluation related to restaurant, lodging, and club industry. Preparation for a hospitality accounting certification exam.

**HSP M 233: Hospitality Sanitation and Safety**

(3-0) Cr. 3. F.S.

Sanitation and safety principles in hospitality operations. Issues impacting consumers and operators.

**HSP M 248: Introduction to Senior Living Management**

(3-0) Cr. 3. F.

Survey course provides a comprehensive overview of the history, current issues, and future trends of the senior living industry. Basics about major aspects of senior living management.

**HSP M 260: Global Tourism Management**

(3-0) Cr. 3. F.S.

Overview of the global tourism industry: hospitality and related services, destination/ attractions, tourist behaviors, and destination marketing. Introduction to destination mix, socio-economic and cultural impacts of tourism, destination organizations, tourist motivations, destination image, marketing, promotions, tourism distribution system, and the future of tourism.

Meets International Perspectives Requirement.

**HSP M 280: Non-Alcoholic Beverages and Café Operations**

(3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in HSP M 133*

Advanced knowledge, preparation, and service of non-alcoholic beverages applied for café operations.

**HSP M 289: Contemporary Club Management**

(3-0) Cr. 3. S.

*Prereq: HSP M 101*

Organization and management of private clubs including city, country, and other recreational and social clubs. Field trip may be required.

**HSP M 290: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Freshman or Sophomore classification. Permission of instructor, advisor, and department chair.*

Independent study on topics of special interest to the student, facilitated by approved faculty member. Maximum of 9 credits combined of HSP M 290 and HSP M 490 can be applied to graduation.

**HSP M 301: Hospitality Revenue Management**

(3-0) Cr. 3. F.

An overview of the revenue management in the lodging and food service industry will be provided. Emphasis will be placed on the application of analytical and forecasting techniques to formulate and implement pricing strategies in responses to daily operation complexities.

**HSP M 315: Hospitality Law**

(3-0) Cr. 3. S.

Laws relating to ownership and operation of hospitality organizations. The duties and rights of both hospitality business operators and customers. Legal implications of various managerial decisions.

**HSP M 320: Attractions and Amusement Park Administration**

(3-0) Cr. 3. S.

*Prereq: HSP M 101 or permission of instructor*

Examination of current issues in the attractions and amusement park industry. Emphasis will be placed on development and design along with the functional departments of modern amusement parks and themed attractions.

**HSP M 333: Hospitality Operations Cost Controls**

(3-0) Cr. 3. F.

*Prereq: (Credit or concurrent enrollment in HSP M 380 and HSP M 380L); 3 credits MATH; HSP M 230*

Introduction to revenue and cost systems in the hospitality industry. Application of principles related to procurement, production, and inventory controls.

**HSP M 352: Lodging Operations Management I**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in HSP M 101*

Introduction to functional department activities and current issues of lodging organizations with emphasis on front office operations and guest services including reservation activities, forecasting, and auditing exercises.

**HSP M 358: Economics for Senior Living Management**

(3-0) Cr. 3. F.

*Prereq: HSP M 248*

Overview of supply and demand, product/service development, consumption, and financials of the senior living industry from a management perspective.

**HSP M 380: Food Production Management**

(3-0) Cr. 3. F.S.

*Prereq: HSP M 133 or 2 cr MICRO; FS HN 111 or FS HN 214; FS HN 115 or FS HN 215; at least junior classification; enrollment in HSP M 380L*

Principles of and procedures used in food production management including menu planning, costing, work methods, food production systems, quality control, and service.

**HSP M 380L: Food Production Management Experience**

(1-6) Cr. 3. F.S.

*Prereq: HSP M 133 or 2 cr MICRO; FS HN 111 or FS HN 214; FS HN 115 or FS HN 215; at least junior classification; enrollment in HSP M 380*

Application of food production and service management principles and procedures in the program's foodservice operation. Filed trip.

**HSP M 383: Wine and Spirits in Hospitality Management**

(2-0) Cr. 2. F.S.

*Prereq: Must be at least 21 years old*

Introduction to history and methods of production for a variety of wines and spirits. Beverage tasting and sensory analysis; product knowledge; service techniques; sales; and alcohol service related to the hospitality industry. Field trip.

**HSP M 383L: Wine, Spirits, and Mixology Laboratory in Hospitality Management**

(1-2) Cr. 2. F.S.

*Prereq: Must be at least 21 years old.*

The application of the management principles and procedures related to the sale and service of alcohol, specialty beverages, and cocktails served in the beverage and hospitality industry. Beverage tasting and sensory analysis of products commonly served in the beverage industry. Field trip.

**HSP M 385: Beer and Brewed Beverages in Hospitality Management**

(2-0) Cr. 1. F.S.

*Prereq: Must be at least 21 years old*

Introduction to history and methods of production for a variety of beer, cider, perry, mead, sake and other brewed alcoholic beverages. Beverage tasting and sensory analysis; product knowledge; and service techniques related to the beverage and hospitality industry. Field trip. 8-week course.

**HSP M 391: Foodservice Systems Management I**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in HSP M 380 and HSP M 380L*

Principles and techniques related to basic management, leadership, and human resource management of foodservices in health care and other on-site foodservice settings. Food safety and sanitation for on-site foodservice operations. Credit for either HSP M 391 or AESHM 287 and AESHM 438 may count toward graduation. Not accepted for credit toward a major in Hospitality Management.

**HSP M 392: Foodservice Systems Management II**

(3-0) Cr. 3. S.

*Prereq: HSP M 391*

Introduction to cost control in foodservice operations: procedures for controlling food and labor variable costs. Application of principles related to food product selection, specification, purchase, and storage in health care and other onsite operations. Interpretation and application of financial records. Credit for either HSP M 392 or HSP M 233 and HSP M 333 may count toward graduation. Not accepted for credit toward a major in Hospitality Management.

**HSP M 393: Hospitality Management Industry Workshop**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: HSP M major; Junior or Senior Classification; Permission of Instructor*

Intensive 2 to 8 week workshop exploration. Topics vary each time offered. Maximum of 6 credits of HSPM 393 can be applied toward graduation.

**HSP M 420: Fairs and Festivals Management**

(3-0) Cr. 3.

*Prereq: HSP M 320*

Examine current issues within fairs and festivals. Emphasis placed on the evolution of exhibitions to modern day fairs and festivals, along with the processes necessary for operating fairs and festivals.

**HSP M 433: Hospitality Financial Management**

(3-0) Cr. 3. S.

*Prereq: ACCT 284; ECON 101; HSP M 333; credit or concurrent enrollment in STAT 101*

Fundamental concepts and issues in hospitality finance and investment. Application of financial statement analysis, accounting ratio analysis, and financial instruments in management decision-making.

**HSP M 437: Hospitality Technology Applications**

(3-0) Cr. 3. F.

*Prereq: HSP M 101*

Introduction to hospitality technology. Emphasis will be placed on basic computer software and hardware components, property managements, point-of-sales systems; customer relationship management, selecting and purchasing computer systems, electronic distribution systems, and communication networks.

**HSP M 439: Advanced Hospitality Human Resource Management**

(3-0) Cr. 3. F.

*Prereq: AESHM 238*

Emphasis on development of management personnel in hospitality organizations. Case studies.

**HSP M 452: Lodging Operations Management II**

(3-0) Cr. 3. S.

*Prereq: HSP M 352*

Development of business plan and evaluation of business performance in a simulated environment. Operational decision making practices by applying concepts of management, operations, marketing, and finance for a computer-mediated environment.

**HSP M 455: Strategic Management in Hospitality**

(3-0) Cr. 3. S.

*Prereq: AESHM 238 and AESHM 340; credit or concurrent enrollment in HSP M 433*

Introduction to strategic management principles and practices with an application of human resources, operations, marketing, and financial management concepts. Case studies.

**HSP M 470: Supervised Professional Internship**

Cr. 3. Repeatable. F.S.SS.

*Prereq: AESHM 270, AESHM 211, 9 credits in HSP M, and minimum 2.0*

*GPA; permission by application; junior or senior classification; employer/ experience should be different than employer/experience used for AESHM 170 and AESHM 270*

Supervised work experience with a cooperating firm or organization, documentation of experience, and completion of an internship project. Coursework includes weekly self-reflection and topics related to current issues and career advancement. Employer/experience should be different than employer/experience used for AESHM 170 and AESHM 270. No more than 12 credits from AESHM 170, AESHM 270, and HSP M 470 may be applied toward graduation.

**HSP M 487: Fine Dining Management**

(Dual-listed with HSP M 587). (2-3) Cr. 3. F.

*Prereq: HSP M 380, HSP M 380L, and HSP M 133, or ServSafe(r) Certification*

Exploration of the historical and cultural development of the world food table. Creative experiences with U.S. regional and international foods. Application of management and financial principles in food preparation and service in fine dining settings. Meets International Perspectives Requirement.

**HSP M 489: Issues in Food Safety**

(Cross-listed with AN S, FS HN, VDPAM). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**HSP M 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**HSP M 490B: Independent Study: Hospitality Management**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval*

Independent Study in Hospitality Management.

**HSP M 490D: Independent Study: Lodging Operations**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**HSP M 490E: Independent Study: Foodservice Operations**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**HSP M 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: Sections B-E: Program approval; Section H: Full membership in Honors Program*

**Courses primarily for graduate students, open to qualified undergraduates:**

**HSP M 505: Hospitality Management Scholarship and Applications**

(0-1) Cr. 1-3. Repeatable. F.SS.

Focus on teaching and research scholarship involving the hospitality industry.

**HSP M 506: Research Seminar in Hospitality Management**

(0-1) Cr. 1. Repeatable. S.

Focus on current research in hospitality industry. Discuss research designs and methods commonly used in hospitality management research; Introduce research proposal development procedures.

**HSP M 533: Financial Decision Making in Hospitality Organizations**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Concepts of financial management applied to strategic decision making.

**HSP M 538: Human Resources Development in Hospitality Organizations**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: AESHM 238*

Theories of human resources management. Practices and principles related to development of management personnel.

**HSP M 540: Strategic Marketing**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: AESHM 340*

Application of marketing principles in developing effective marketing strategies for hospitality, apparel, and retail organizations. Evaluation of multi-dimensional marketing functions in hospitality organizations.

**HSP M 555: Strategic Management in Hospitality Organizations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Courses in MKT, FIN, MGMT, and HSP M. Permission of instructor*

Strategic management process as a planning and decision-making framework; integration of human resources, operations, marketing, and financial management concepts.

**HSP M 560: Tourism Management and Tourist Behavior**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HSP M 260 or equivalent*

Tourism theories and research. Overview of tourism industry, tourism theories, methods, and current issues in destination marketing and management and travel behavior. Evaluation of tourism and destination research.

**HSP M 587: Fine Dining Management**

(Dual-listed with HSP M 487). (2-3) Cr. 3. F.

*Prereq: HSP M 380, HSP M 380L, and HSP M 133, or ServSafe(r) Certification*

Exploration of the historical and cultural development of the world food table. Creative experiences with U.S. regional and international foods.

Application of management and financial principles in food preparation and service in fine dining settings.

Meets International Perspectives Requirement.

**HSP M 590: Special Topics**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process*

Topics in hospitality management.

**HSP M 590B: Special Topics: Hospitality Management**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590C: Special Topics: Tourism**

Cr. arr. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: 9 credits in HSP M at 400 level or above; application process*

Special topics in tourism.

**HSP M 590D: Special Topics: Lodging Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590E: Special Topics: Commercial/Retail Foodservice Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590F: Special Topics: Onsite Foodservice Operations**

Cr. arr. Repeatable, maximum of 3 credits.

*Prereq: 9 credits in HSP M at 400 level or above; application process.*

**HSP M 590G: Special Topics: Event Management**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in HSP M or EVENT at 500 level or above; application process*

Special Topics in Event Management. Only 6 credits of HSP M 590G can be applied toward graduation.

**HSP M 599: Creative Component**

Cr. arr.

Creative component as arranged with instructor.

**Courses for graduate students:**

**HSP M 604: Professional Writing**

(2-0) Cr. 2. S.SS.

*Prereq: Enrollment in PhD program*

Development of professional written communication with emphasis on abstracts, proposals, and manuscripts.

**HSP M 608: Administrative Problems**

Cr. arr. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of instructor; enrollment in PhD program*

Advanced administrative problems; case studies in foodservice and lodging organizations.

**HSP M 633: Advanced Hospitality Financial Management**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 433; Enrollment in PhD program*

Theories and research in financial management with emphasis on financial performance and financing decisions.

**HSP M 638: Advanced Human Resources Management in Hospitality Organizations**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 538; Enrollment in PhD program*

Research in human resources management with an emphasis on organization or unit administration.

**HSP M 640: Seminar on Marketing Thoughts**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. SS., offered irregularly.

*Prereq: HSP M 540; STAT 401. Enrollment in PhD program*

Conceptual and theoretical development of marketing strategies. Analytical and critical review of marketing research and industry practices.

**HSP M 652: Advanced Lodging Operations**

(3-0) Cr. 3. Alt. S., offered irregularly. Alt. SS., offered irregularly.

*Prereq: Enrollment in PhD program*

Analysis and applications of concepts and theories of operations research for lodging operations.

**HSP M 660: Research Seminar in Tourism Management**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Enrollment in PhD program*

Advanced graduate course on tourism and destination theories and research. Analysis and application of theories, research findings, and research methods in tourism and destination management.

**HSP M 680: Analysis of Research in Foodservice Operations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in PhD program*

Analysis and application of theories, research, and research methods in foodservice operations.

**HSP M 690: Advanced Topics**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690B: Advanced Topics: Hospitality Management**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690C: Advanced Topics: Tourism**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690D: Advanced Topics: Lodging Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690E: Advanced Topics: Commercial/Retail Foodservice Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.

**HSP M 690F: Advanced Topics: Onsite Foodservice Operations**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in hospitality management.



**HSP M 690G: Advanced Topics: Event Management**

Cr. arr. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in PhD program, application process*

Advanced study of current topics in event management and hospitality management.

**HSP M 699: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in PhD program*

Research.

## Human Computer Interaction (HCI)

*Any experimental courses offered by HCI can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**HCI 504: Evaluating Technology-based Learning Environments**

(Cross-listed with EDUC). (3-0) Cr. 3. S.

*Prereq: EDUC 501*

Principles and procedures to plan, design, and conduct effective evaluation studies (formative, summative, usability) in different settings are studied. Opportunities to engage in real or simulated evaluation projects of substantial scope are provided. Create evaluation instruments, develop methods with which to evaluate a product or program, conduct try-outs or usability sessions, analyze the data, report the findings, and recommendations are some of the course activities.

**HCI 509: Computer/Video Game Design and Development**

(Cross-listed with ARTIS). (0-6) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Permission of instructor*

Independent project based creation and development of "frivolous and non-frivolous" computer games in a cross-disciplinary team. Projects require cross-disciplinary teams. Aspects of Indie development and computer/video game history will be discussed.

**HCI 510: Foundations of Game-based Learning**

(Cross-listed with EDUC). Cr. 3. S.

*Prereq: 12 Graduate Credits*

Theories, principles and best practices of utilizing games in educational environments. Topics include the theoretical foundations of learning games and game play, identity development in online environments, and assessment of learning in and out of games.

**HCI 515: Statistical Natural Language Processing**

(Cross-listed with ENGL, LING). (3-0) Cr. 3.

*Prereq: STAT 330 or equivalent, recommended ENGL 219 or LING 219, or ENGL 511 or LING 511*

Introduction to computational techniques involving human language and speech in applications such as information retrieval and extraction, automatic text categorization, word prediction, intelligent Web searching, spelling and grammar checking, speech recognition and synthesis, statistical machine translation, n-grams, POS-tagging, word-sense disambiguation, on-line lexicons and thesauri, markup languages, corpus analysis, and Python programming language.

**HCI 520: Computational Analysis of English**

(Cross-listed with ENGL, LING). (3-0) Cr. 3.

*Prereq: ENGL 510 or LING 510, and ENGL 511 or LING 511*

Concepts and practices for analysis of English by computer with emphasis on the applications of computational analysis to problems in applied linguistics such as corpus analysis and recognition of learner language in computer-assisted learning and language assessment.

**HCI 521: Cognitive Psychology of Human Computer Interaction**

(Cross-listed with PSYCH). (3-0) Cr. 3.

*Prereq: Graduate classification or instructor approval*

Biological, behavioral, perceptual, cognitive and social issues relevant to human computer interactions.

**HCI 522: Scientific Methods in Human Computer Interaction**

(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PSYCH 521 and STAT 101 or equivalent*

Basics of hypothesis testing, experimental design, analysis and interpretation of data, and the ethical principles of human research as they apply to research in human computer interaction.

**HCI 525: Optimization Methods for Complex Designs**

(3-0) Cr. 3. F.

*Prereq: MATH 265; M E 160*

Optimization involves finding the 'best' according to specified criteria. Review of a range of optimization methods from traditional nonlinear to modern evolutionary methods such as Genetic algorithms. Examination of how these methods can be used to solve a wide variety of design problems across disciplines, including mechanical systems design, biomedical device design, biomedical imaging, and interaction with digital medical data. Students will gain knowledge of numerical optimization algorithms and sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Experience includes code writing and off-the-shelf routines. Numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques.



**HCI 571: Augmented Reality**

(3-0) Cr. 3.

*Prereq: M E 557/CPR E 557/COM S 557, or equivalent computer graphics experience*

Fundamental technologies enabling augmented reality (AR) application development. Assessment and integration of the hardware and software systems necessary for AR including, tracking, image processing and rendering. Programming skills in C++ and GPU-based optimization are developed to enable evaluation of interaction devices and modalities afforded by AR.

**HCI 574: Computational Implementation and Prototyping in HCI**

Cr. 3. S.

Fundamental concepts of software programming and the practical use of the Python programming language. Assignments include user interaction and interface design, information visualization, as well as other computational HCI tools. Intended for graduate students without prior background in software development. Requires programming during class lectures.

**HCI 575: Computational Perception**

(Cross-listed with COM S, CPR E). (3-0) Cr. 3. S.

*Prereq: Graduate standing or permission of instructor*

This class covers statistical and algorithmic methods for sensing, recognizing, and interpreting the activities of people by a computer. This semester we will focus on machine perception techniques that facilitate and augment human-computer interaction. The main goal of the class is to introduce computational perception on both theoretical and practical levels. Participation in small groups to design, implement, and evaluate a prototype of a human-computer interaction system that uses one or more of the techniques covered in the lectures.

**HCI 580: Virtual Environments, Virtual Worlds, and Application**

(Cross-listed with M E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Senior or Graduate status.*

A systematic introduction to the underpinnings of Virtual Environments (VE), Virtual Worlds, advanced displays and immersive technologies; and an overview of some of the applications areas particularly virtual engineering.

**HCI 585: Developmental Robotics**

(Cross-listed with CPR E). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: knowledge of C/C++ programming language.*

An introduction to the emerging interdisciplinary field of Developmental Robotics, which crosses the boundaries between robotics, artificial intelligence, developmental psychology, and philosophy. The main goal of this field is to create autonomous robots that are more intelligent, more adaptable, and more useful than the robots of today, which can only function in very limited domains and situations.

**HCI 587: Models and Theories in Human Computer Interaction**

(3-0) Cr. 3.

Survey of the multidisciplinary models and theories that form the foundation of the science of Human Computer Interaction. Application of the scientific method to solve practical problems by using analyses or approaches from the behavioral and social sciences, and information and computer technology.

**HCI 589: Design and Ethics**

(Cross-listed with ARTGR). (3-0) Cr. 3. F.S.

*Prereq: Graduate classification or permission of instructor.*

Issues in ethics and decision-making as they relate to technology, design, design research, HCI, and the design industry.

**HCI 590: Special Topics**

Cr. arr. Repeatable.

Investigation of problems of special interest in human computer interaction.

**HCI 591: Seminar in Human Computer Interaction**

Cr. 1-3. Repeatable.

**HCI 595: Visual Design of HCI**

Cr. 3. SS.

Human interaction design as it applies to HCI. Aspects of audience analysis, design methodologies for creating concepts and solutions, techniques of concept prototyping, and the fundamentals of visual design such as color, type, symbolism, and grid structure. Class discussions, tutorials, and hands-on projects.

**HCI 596: Emerging Practices in Human-Computer Interaction**

Cr. 3. SS.

*Prereq: HCI 521*

Innovative or newly emerging ideas within the HCI research field or applied industry practice, e.g., based on changing cultures or attitudes, new technologies, and new economic forces.

**HCI 599: Creative Component**

(3-0) Cr. 3.

Creative component for nonthesis option of Master of Science degree. Offered on a satisfactory-fail basis only.

**Courses for graduate students:**

**HCI 603: Advanced Learning Environments Design**

(Cross-listed with EDUC). (3-0) Cr. 3. S.

*Prereq: EDUC 503*

Exploration of advanced aspects of the learning environments design process. Application of analysis, design, development and production, evaluation, implementation, and project management principles. Theory and research in educational technology provides the foundation for design decisions. Focus on current trends in learning environment design and the production and use of educational technology.

**HCI 608: Social Media and Education**

(Cross-listed with EDUC). (3-0) Cr. 3. F.

*Prereq: 12 graduate credits*

Increase understanding of how social media is changing traditional concepts of identity, literacy, citizenship and more. Develop an online social presence through active social media participation.

**HCI 655: Organizational and Social Implications of Human Computer Interaction**

(Cross-listed with MIS). (3-0) Cr. 3.

*Prereq: Graduate Classification*

Examine opportunities and implications of information technologies and human computer interaction on social and organizational systems. Explore ethical and social issues appurtenant to human computer interaction, both from a proscriptive and prescriptive perspective. Develop informed perspective on human computer interaction. Implications on research and development programs.

**HCI 681: Cognitive Engineering**

(Cross-listed with I E). (3-0) Cr. 3.

*Prereq: I E 572 or I E 577 or PSYCH 516 or HCI/PSYCH 521 or equivalent*

Provides an overview of human cognitive capabilities and limitations in the design of products, work places, and large systems. Contexts vary broadly and could range from simple use of mobile devices to an air-traffic control or nuclear plant command center. Course focuses on what we can infer about users' thoughts and feelings based on what we can measure about their performance and physiological state. Covers the challenge of designing automated systems.

**HCI 697: HCI Internship**

Cr. R. Repeatable.

*Prereq: Permission of Director of Graduate Education, graduate classification***HCI 699: Research**

Cr. arr. Repeatable.

## Human Development and Family Studies (HD FS)

***Any experimental courses offered by HD FS can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****HD FS 102: Human Development**

(3-0) Cr. 3. F.S.SS.

Overview of life-span developmental tasks (physical, cognitive, language, social, emotional) examined from various theoretical perspectives. Discussion of topics related to family diversity, individual/family health and well-being and reciprocal relationships as affected by external factors.

**HD FS 110: Freshman Learning Community Orientation**

(1-0) Cr. 1. F.

*Prereq: Membership in HD FS Learning Community*

Introduction to the Department of Human Development and Family Studies including academic requirements and opportunities, strategies for transitioning to college, learning and study strategies, reading and reflection, and career awareness.

**HD FS 111: New Transfer Student Seminar**

(1-0) Cr. 1. F.S.

Introduction to HD FS curricula and faculty for students in CH FS, FCEDS or F C P. Department and University policies and procedures, degree audits, and registration. Exploration of campus resources and strategies for student success. Offered on a satisfactory-fail basis only.

**HD FS 183: Personal Finance in Early Adulthood**

(1-0) Cr. 1. F.S.SS.

Introduction to basic concepts and budgeting practices for management of resources and prevention of financial problems commonly associated with college, including credit and student loans. Offered on a satisfactory-fail basis only.

**HD FS 208: Early Childhood Education Teacher Orientation**

Cr. 1. F.S.

*Prereq: Early Childhood Education major*

Overview of early childhood education (birth-grade 3) teacher licensure requirements. Program planning and university procedures. Required of all students majoring in early childhood education. Offered on a satisfactory-fail basis only.

**HD FS 218: Professional Orientation and Service Learning**

(2-0) Cr. 2. F.S.

*Prereq: Credit or concurrent enrollment in HD FS 102; major in Human Development and Family Studies*

Ethics, professional development, and career exploration in child, adult and family services. Visits to and service learning with programs that serve children, adults and families with diverse needs. Participation in service learning project required.

**HD FS 223: Child Development and Health**

(3-0) Cr. 3. S.

Typical and atypical development of children prenatal through middle childhood. Examination of healthy development and potential impact of health issues in children. Discussion of influence of the family and society on development. Either HD FS 223 or HD FS 224, but not both, may be applied toward graduation.

**HD FS 224: Development in Young Children: Birth through Age 8**

(3-1) Cr. 3. F.S.

*Prereq: HD FS 102*

Learning, growth, and development (typical and atypical) of children from birth through age eight. Explores importance of family, programs, and a diverse society. Strategies for observing, recording, and interpreting children's cognitive, communication, motor, social, and emotional development. Practicum. Either HD FS 223 or HD FS 224, but not both, may be applied toward graduation.

**HD FS 226: Development and Guidance in Middle Childhood**

(3-0) Cr. 3. F.

*Prereq: HD FS 102 or PSYCH 230*

Physical, cognitive, socioemotional, and identity development from 5 to 12 years of age. Development within the contexts of family, school, peers, and society. Guidance of children in family and group settings.

**HD FS 227: Adolescence and Emerging Adulthood**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 102 or PSYCH 230*

Physical, cognitive, and socioemotional development of adolescents and emerging adults in the context of family, relationships, and culture.

**HD FS 234: Adult Development**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: HD FS 102 or PSYCH 230*

Introductory exploration of the health, individual and social factors associated with adult development including younger adulthood, middle age and older adulthood. Information is presented from a life-span developmental framework.

**HD FS 239: Consumer Issues**

(3-0) Cr. 3. F.S.

Introduction to factors affecting consumer decisions of individuals and families, including housing, healthcare, and personal finances. Emphasis on accessibility and affordability, community contexts for families; and consumer protection, legislation and regulation, and consumer fraud.

Meets U.S. Diversity Requirement

**HD FS 240: Literature for Children**

(3-0) Cr. 3. F.S.

Evaluation of literature for children, including an emphasis on diversity and inclusion; cultural competence. Roles of literature in the overall development of children. Literature selection and use in the home and educational settings.

**HD FS 249: Parenting and Family Diversity Issues**

(3-0) Cr. 3. F.S.

Evidence-based, best-practice approaches to child-rearing, guidance, adult-child relationships, and parenting education programs. Theoretical perspectives related to caregiving processes across the lifespan.

**HD FS 270: Family Communications and Relationships**

(3-0) Cr. 3. F.S.Alt. SS., offered odd-numbered years.

Family communication and its functions to develop, maintain, enrich and limit family relationships. Family theories related to communication and ethical considerations when working with families.

**HD FS 276: Human Sexuality**

(3-0) Cr. 3. F.S.SS.

Behavioral, biological, and psychological aspects of human sexuality within the social context of family, culture, and society. Role of sexuality in human development. Critical analysis of media and research. Communication and decision-making skills relating to sexuality issues and relationships.

Meets U.S. Diversity Requirement

**HD FS 283: Personal and Family Finance**

(3-0) Cr. 3. F.S.

Introduction to basic principles of personal and family finance. Budgeting, record keeping, checking and savings accounts, consumer credit, insurance, investments, and taxes.

Meets U.S. Diversity Requirement

**HD FS 283H: Personal and Family Finance: Honors**

(3-0) Cr. 3. F.S.

Introduction to basic principles of personal and family finance. Budgeting, record keeping, checking and savings accounts, consumer credit, insurance, investments, and taxes. Additional work required to meet Honors requirements.

Meets U.S. Diversity Requirement

**HD FS 317: Field Experiences**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 317B: Field Experiences: Human Development and Family Studies**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: 9 credits in HD FS; Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 317G: Field Experiences: Family Finance Programs**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs.

**HD FS 317H: Field Experiences: Honors**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: 9 credits in HD FS; Department Permission*

Consult department office for procedure. Supervised field experience in human development and family studies programs. Offered on a satisfactory-fail basis only.

**HD FS 340: Assessment and Curriculum: Ages Birth through 2 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224; admission to Educator Preparation program*

Assessment strategies for infants and toddlers, including those with special needs. Curricula, learning environments, teaching strategies, health and nutritional practices, and schedules that are developmentally, individually, and culturally appropriate. Using assessment to plan, implement, and evaluate activities to promote physical, motor, cognitive, communication, and social emotional development. Practicum.

**HD FS 341: Income Tax Planning for Families**

(3-0) Cr. 3. F.

Practice and planning to minimize tax liability and maximize after-tax returns for individuals and families. Addresses components of the US personal income tax system including tax forms, filing status, income, exemptions, exclusions, deductions, adjustments, credits, penalties, and tax rates. The case-problem approach prepares students to plan for themselves and to advise others.

**HD FS 342: Social and Emotional Development and Child-centered Guidance in Early Childhood**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 224*

Guiding prosocial development, self-regulation, and task engagement of children birth to age 8. Focus is on promoting prosocial behaviors through supportive relationships and environments within diverse home, center, or school settings. Functional behavior assessment and ongoing progress monitoring for targeted and intensive interventions. Practicum. Must take HD FS 340, 343, or 344 the same semester.

**HD FS 343: Assessment and Curriculum: Ages 3 through 6 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224; HD FS 240; admission to Educator Preparation program*

Assessment strategies for preschool and kindergarten children, including those with special needs. Learning environments, schedules, activities, nutritional practices, and teaching strategies that are developmentally, individually, and culturally appropriate. Using assessment to plan, implement, and evaluate activities to promote physical motor, cognitive, communication, and social emotional development. Practicum.

**HD FS 344: Programming for Children in Early Care and Education**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 224*

Programming in inclusive child care centers and family child care homes, including those with special needs, aged birth through 8 years. Developing, implementing, and evaluating learning environments; activities and materials; behavioral guidance and classroom management practices; health and nutritional practices; and schedules to ensure developmental, individual, and cultural appropriateness. Monitoring children's development and behavior to promote physical, motor, cognitive, communication, and social emotional development. Learning to collaborate effectively with parents and staff. Practicum.

**HD FS 345: Inclusive Teaching and Interaction Strategies**

(3-0) Cr. 3. F.S.

*Prereq: (HD FS 224; SP ED 250) or Permission of Instructor*

Instructional strategies, adaptations and specialized materials and equipment to meet the developmental needs of all young learners ages birth through 8 years old, especially those with diverse learning needs and multiple disabilities. Addressing inclusivity, the history of early childhood special education, and the planning and writing of individualized education plans.

**HD FS 360: Housing and Services for Families and Children**

(3-0) Cr. 3. F.

*Prereq: 6 credits from the following courses: AESHM 421; AF AM 330; AMD 165, 362, 467; AM IN 310, 215, 322; ANTHR (except 202); CJ (except 220, 332); ECON; FS HN 342; INTST 235; LING 219, 275, 471; POL S; PSYCH (except 131); SOC; WGS 201, 203, 301, 320, 327, 328, 346, 350, 385*

Approaches to and assessment of housing and services that assist those with special needs including those with disabilities, low-income, children at risk, single-parents, and the homeless. Emphasis on community settings; e.g., residential facilities, group housing, shelters and transitional housing.

**HD FS 367: Abuse and Illness in Families**

(3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: 3 credits from the following courses: AESHM 421; AF AM 330; AMD 165, 362, 467; AM IN 310, 215, 322; ANTHR (except 202); CJ (except 220, 332); ECON; FS HN 342; INTST 235; LING 219, 275, 471; POL S; PSYCH (except 131); SOC; WGS 201, 203, 301, 320, 327, 328, 346, 350, 385*

Causes and consequences of family stressors including physical, sexual, and emotional abuse; substance abuse; and mental and physical illness across the life span. Interplay between victims, offenders, and the treatment system.

**HD FS 369: Research Methods in Human Development and Family Studies**

(3-1) Cr. 3. F.S.

*Prereq: (HD FS 102 or PSYCH 230); Junior or Senior classification*

Understanding and evaluating research. Use of primary and secondary data to identify and study problems related to human development and family issues. An introduction to statistical concepts and data analysis. Computer laboratory experience.

**HD FS 373: Death as a Part of Living**

(Cross-listed with GERON). (3-0) Cr. 3. F.S.Alt. SS., offered even-numbered years.

*Prereq: HD FS 102*

Consideration of death in the life span of the individual and the family with opportunity for exploration of personal and societal attitudes.

**HD FS 377: Aging and the Family**

(Cross-listed with GERON). (3-0) Cr. 3. F.Alt. SS., offered odd-numbered years.

Interchanges of older adults and their families. Emphasis on role changes, social interaction, and independence as influenced by health, finances, life styles, and community support.

**HD FS 378: Retirement Planning and Employee Benefits**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits.

**HD FS 378H: Retirement Planning and Employee Benefits: Honors**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 3 credits in ECON, HD FS, or FIN*

Financial needs analysis for retirement, characteristics of employer-sponsored and individual retirement plans, tax implications of retirement plans, Social Security funding and benefits, strategies for meeting varying retirement needs in a diverse society, financial counseling and planning practice, and overview of employee benefits. Additional work required to meet Honors requirements.

**HD FS 383: Fundamentals of Financial Planning**

(3-0) Cr. 3. S.

*Prereq: HD FS 283*

Fundamental principles of the financial planning process, client/planner interactions, time value of money applications as well as analyses of ethics review, financial statements, cash flow and debt management, education planning, retirement planning, tax planning, and estate planning needs of families.

**HD FS 384: Family Insurance Planning**

Cr. 3. S.

*Prereq: HD FS 283*

Strategies for managing family financial risk with insurance. Emphasis on communication and planning process and the use of risk mitigation and insurance within families. Risk analysis and management within the comprehensive family financial planning process.

**HD FS 387: Applying Evidence-Based Practices in Human Services**

(3-0) Cr. 3. F.S.

*Prereq: Junior or Senior classification*

Practicing skills required to work with individuals and families in assessment, engagement, and intervention. Applying strategies including motivational interviewing and trauma informed care.

Meets U.S. Diversity Requirement

**HD FS 395: Children, Families, and Public Policy**

(3-0) Cr. 3. F.S.Alt. SS., offered odd-numbered years.

*Prereq: HD FS 369 or Permission of Instructor*

Public policy and public service programs as they affect children and families. Examination of how individuals and groups influence policy. Investigation of current issues and programs influencing the well-being and welfare of children and families.

**HD FS 416: Human Development and Family Studies Seminar**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 8 credits in HD FS*

Intensive study of a selected topic in human development and family studies.

**HD FS 417: Supervised Student Teaching**

Cr. 8. Repeatable.

*Prereq: Permission of Instructor***HD FS 417C: Supervised Student Teaching: Early Childhood Special Education Programs.**

Cr. 8. Repeatable. F.S.

*Prereq: HD FS 455; HD FS 456; minimum 2.5 cumulative GPA; admission to Educator Preparation program*

Teaching experience with preschool children with disabilities.

**HD FS 418: Professional Practice Reflection/Discussion**

Cr. 0.5-2. Repeatable. F.S.

Discussion of professional practice experience.

**HD FS 418A: Professional Practice Reflection/Discussion: Teaching**

(0.5-0) Cr. 0.5. F.S.

*Prereq: Concurrent enrollment in HD FS 417*

Discussion of HD FS 417 student teaching field experience. Offered on a satisfactory-fail basis only.

**HD FS 418B: Professional Practice Reflection/Discussion: Internships**

(2-0) Cr. 2. F.S.

*Prereq: HD FS 218; Junior or Senior classification*

Process and development of skills necessary for professional preparation and practice including career planning, resume writing, and interviewing. Strategies for successful career management. Offered on a satisfactory-fail basis only.

**HD FS 449: Program Evaluation and Proposal Writing**

(3-0) Cr. 3. F.S.

*Prereq: Junior or Senior classification*

Theory and practice of program evaluation and proposal writing in human services including needs assessment, outcome development and measurement, and proposal components. Assessment of programs' success in meeting goals.

**HD FS 455: Curriculum and Interventions: Ages 3 through 6 Years**

(3-3) Cr. 4. F.S.

*Prereq: HD FS 343; HD FS 345; SP ED 405; SP ED 458*

Program models and methods leading to development and organization of appropriate curricula in preschool and kindergarten programs for young children with diverse learning needs. Government regulations and professional standards for child programming. Teaming with parents, colleagues, and paraprofessionals to plan, implement, and evaluate developmentally and culturally appropriate individualized education plans in inclusive settings. Practicum.

**HD FS 456: Working with Families in Early Intervention**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 340 or HD FS 344 or Permission of Instructor*

Applying family systems theory and family centered principles in early intervention. Understanding the impact of disability on families and young children. Utilizing strategies for delivering family-centered interventions and service coordination in home-based and natural environments. Building trusting relationships, teaming with families and interdisciplinary colleagues to create, implement, and evaluate Individualized Family Service Plans (IFSPs) for children birth to age three. Understanding foundations of theory and policy and empowering families through effective supports and services. Experiences with families.

**HD FS 479: Family Dynamics Through a Social and Cultural Lens**

(3-0) Cr. 3. F.S.

*Prereq: (HD FS 102 or PSYCH 230); (HD FS 369 or Permission of Instructor); Junior or Senior classification*

Exploration of social and cultural factors that influence family dynamics. Outcomes for families examined through a social justice lens. Students will examine how their social and cultural contexts impact their work within their chosen careers.

**HD FS 482: Family Savings and Investments**

(3-0) Cr. 3. F.

*Prereq: ECON 101; HD FS 383; STAT 101*

Management of family financial resources; emphasis on savings and the investment planning process; issues facing financial planners who manage family assets. Identification of investment options including common stocks, fixed income securities, convertible securities, and related choices.

**HD FS 484: Estate Planning for Families**

(3-0) Cr. 3. S.

*Prereq: HD FS 283*

Study of estate planning focusing on efficient conservation and transfer of wealth, consistent with client's goals. Legal, tax, financial and non-financial aspects of estate planning process; trusts, wills, probate, advanced directives, charitable giving, wealth transfers and related taxes.



**HD FS 485: Capstone: Family Financial Planning**

(3-0) Cr. 3. S.

*Prereq: (FIN 361 or HD FS 384); HD FS 341; HD FS 378; HD FS 383; HD FS 482*  
Development and refinement of competencies required by personal financial planners to work with individuals and families in meeting financial objectives. Utilization of skills obtained in financial planning emphasis to complete one or more financial planning narratives.

**HD FS 486: Administration of Human Services Programs**

(3-0) Cr. 3. F.S.

*Prereq: HD FS 369; 3 additional credits in HD FS at 300 level or above; Junior or Senior classification*

Examination of purpose, policies, staffing, operations, and clientele of organizations serving children, adults and families with diverse needs. Management/leadership principles and techniques. Introduction to financial management. Administrators/supervisors roles in employee management as well as development of client-oriented programs, fundraising, goal setting, strategic planning, and advocacy.

**HD FS 489: Financial Counseling**

(Dual-listed with HD FS 589). (2-0) Cr. 2. F.

*Prereq: HD FS 489; HD FS 283, HD FS 589: Graduate classification*

Personal, social/psychological and legal climates affecting family financial decisions. A life cycle approach to financial decision making. Development of financial counseling and planning skills to assist families and individuals to become self-sufficient in family financial management.

**HD FS 489L: Financial Counseling Laboratory**

(Dual-listed with HD FS 589L). (0-2) Cr. 1. Repeatable, maximum of 2 credits. F.

*Prereq: HD FS 489L; HD FS 283, HD FS 589: Graduate classification*

Hands-on financial counseling experience using preventative, remedial, and productive strategies in one-on-one and/or group situations. Students work with clients to develop diverse and inclusive decision-making and problem-solving methods to achieve goals or to remove barriers.

**HD FS 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*  
Consult department office for procedure.

**HD FS 490H: Independent Study: Honors**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*  
Consult department office for procedure.

**HD FS 490I: Independent Study: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq: 6 credits in HD FS; Permission of Instructor*  
Consult department office for procedure.

**HD FS 491: Internship**

Cr. 4-9. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: HD FS 418B; Senior classification; minimum 2.0 cumulative GPA; Department Permission*

Supervised work experience related to the student's curriculum. Offered on a satisfactory-fail basis only.

**HD FS 493: Workshop**

(Dual-listed with HD FS 593). Cr. arr. Repeatable. F.S.SS.

*Prereq: Senior classification*

Workshop in HD FS.

**HD FS 499: Research**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Supervised research experience.

**Courses primarily for graduate students, open to qualified undergraduates:**

**HD FS 501: Graduate Studies, Research, and Ethics in HD FS**

(2-0) Cr. 2. F.

*Prereq: Admission to HD FS Graduate program*

Overview of graduate study, research, ethics, and professional development in the field of human development and family studies. Curriculum, programs of study, portfolios, faculty research interests, dissemination of research, career planning, and teaching discussed.

**HD FS 502: Professional Development in Human Development and Family Studies**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: graduate classification; HD FS 501*

Overview of professional skills, portfolio building, preparation for academic and nonacademic jobs, leadership fundamentals and project management training, time management, work balance issues, and professional ethics. Opportunities for graduate students to work on their professional development tailored to individual needs of students. Develop an individual professional portfolio.

**HD FS 503: Introduction to Research Design**

(4-0) Cr. 4. F.

*Prereq: Permission of instructor*

Basic research skills including developing research questions, posing testable hypotheses, determining appropriate data collection and analyses, and identifying the benefits and limitations of various sampling strategies. Measurement theory, observational assessments, survey research, experimental and quasi-experimental designs, analysis of secondary data, and qualitative research methods.

**HD FS 504: Qualitative Research Methods**

(3-0) Cr. 3. S.

*Prereq: 9 credits of social sciences or permission of instructor*

Introduction to qualitative research methodology. Application of fieldwork methods, analysis, interpretation, and writing through individual qualitative research projects.

**HD FS 505: Application of Quantitative Research Methods**

(3-0) Cr. 3. S.

*Prereq: HD FS 503 or permission of instructor*

Descriptive and inferential statistics, hypothesis testing, scales of measurement, comparisons of proportions, correlations between variables, the t distribution, analysis of variance, and multiple regression.

**HD FS 510: Theories of Human Development**

(3-0) Cr. 3. F.SS.

*Prereq: 9 credits of social sciences or permission of instructor*

Theoretical approaches and current research in child, adolescent, and adult development. Individual life span perspectives. Implications for research, policy and practice. (Summer course offering is on-line).

**HD FS 511: Family Theory**

(3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theoretical approaches and current research in family development. Review the nature and value of theory to the study of the family and evaluate the use of theory in empirical research. Implications for research, policy and practice.

**HD FS 530: Perspectives in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. F.

Overview of current aging issues including theory and research, critical social and political issues in aging, the interdisciplinary focus of gerontology, career opportunities, and aging in the future.

**HD FS 534: Adult Development**

(Cross-listed with GERON). (3-0) Cr. 3. S.

Exploration of the biological, psychological and social factors associated with aging. Although the focus is on the later years, information is presented from a life-span developmental framework. Empirical studies are reviewed and their strengths, limitations and implications for normative and optimal functioning are discussed.

**HD FS 538: Developmental Disabilities**

(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in human development and family studies or psychology or permission of instructor*

Theories, research, and current issues regarding the intersection of development and disabilities. Investigation of interventions with individuals and families. (on-line course offering via Distance Education).

**HD FS 541: Housing and Real Estate in Family Financial Planning**

(Cross-listed with FFP). (3-0) Cr. 3. Alt. SS., offered even-numbered years.

The role of housing and real estate in the family financial planning process, including taxation, mortgages, financial calculations, legal concerns, and ethical issues related to home ownership and real estate investments. Emphasis on emerging issues in the context of housing and real estate.

**HD FS 545: Economics, Public Policy, and Aging**

(Cross-listed with GERON). (3-0) Cr. 3. F.

Policy development in the context of the economic status of the older adult population. Retirement planning and the retirement decisions; social security and public transfer programs; intra-family transfers to/from the aged; private pensions; financing medical care; prospects and issues for the future.

**HD FS 555: Current Issues and Research in Early Childhood Services**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Analysis of contemporary and historical early childhood/early intervention/early childhood special education model programs and services. Examination of relationships among service systems and implementation, program quality, teacher effectiveness, and outcomes for children with and without disabilities. (on-line course offering via Distance Education).

**HD FS 563: Environments for the Aging**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: HD FS 360 or 3 credits in housing, architecture, interior design, rehabilitation, psychology, or human development and family studies or permission of instructor*

Emphasis on independent living within residential settings including specialized shelter, supportive services and housing management.

Application of criteria appropriate for accessibility and functional performance of activities; universal design principles. Creative project provides service learning opportunities.

Meets U.S. Diversity Requirement

**HD FS 566: Family Policy**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 6 credits in social sciences or permission of instructor*

An introduction to policy for family researchers and practitioners.

Examination of relevant policies through a family lens via discussion of theory and student interests in current and enduring family policies and programs. Descriptions of work roles in family policy and the interaction of family researchers and policymakers.

**HD FS 567: Family Stress, Abuse, and Illness**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Explores research related to family stress within romantic, parent-child, and sibling relationships. Examines contemporary theory and research on the nature, causes, and consequences of family stressors. These stressors include, but are not limited to economic distress; physical and emotional abuse; substance abuse; and mental and physical illness across the life span. (on-line course offering via Distance Education).

**HD FS 568: Individual and Family Assessment**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Use of interviews, observational assessments, direct tests with individuals and families for research and intervention. Opportunities to practice assessments.

**HD FS 575: Cross-cultural Perspectives about Families and Children**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in social sciences or permission of instructor*

Review of current research regarding family diversity including an examination of cultural and structural influences on the development and well-being of families and children. Discussion of the impact on human rights and social justice. (on-line course offering via Distance Education).

**HD FS 577: Aging in the Family Setting**

(Cross-listed with GERON). (3-0) Cr. 3. S.

*Prereq: 9 credits in social sciences or permission of instructor*

Theories and research related to personal and family adjustments in later life affecting older persons and their intergenerational relationships.

Related issues including demographics also are examined through the use of current literature.

**HD FS 579: Family Well-being Across the Lifespan**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in social sciences or permission of instructor*

Review of current research to provide a theoretical and practical understanding of the economic, social, and psychological factors that influence interpersonal relationships and individual well-being within the institution of the family system. Economic and policy effects considered. (on-line course offering via Distance Education).

**HD FS 581: International Study in Human Development and Family Studies**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581A: International Study in HD FS: Practicum**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581B: International Study in HD FS: Exchange**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 581C: International Study in HD FS: Group Study**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission by application*

Limited enrollment. Supervised international study experiences in Human Development and Family Studies. Countries vary.

**HD FS 583: Investing for the Family's Future**

(Cross-listed with FFP). (3-0) Cr. 3. F.

Evaluation of investment markets for the household. Analysis of how families choose where to put their savings. Emphasis is on using the family's overall financial and economic goals to help inform investment choices.

**HD FS 584: Program Evaluation and Research Methods in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. S.

Overview of program evaluation, research methods, and grant writing in gerontology. Includes application of quantitative and qualitative methods in professional settings.

**HD FS 585: Program Evaluation**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* 6 credits in graduate level social sciences or permission of instructor

Theoretical and practical issues related to design and implementation of program evaluation in social sciences. Includes theory, design, implementation, analysis and proposal writing to assist programs to be successful in meeting program goals.

**HD FS 588: Family, Income, and the Economy**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* 9 credits in social sciences or permission of instructor

Analysis of family income, wealth, and economic well-being. Emphasis on effects of family behavior and public policies on the adequacy and security of income across the family life cycle. Implications of resource allocation within the family for adult and child well-being.

**HD FS 589: Financial Counseling**

(Dual-listed with HD FS 489). (2-0) Cr. 2. F.

*Prereq:* HD FS 489: HD FS 283, HD FS 589: Graduate classification

Personal, social/psychological and legal climates affecting family financial decisions. A life cycle approach to financial decision making. Development of financial counseling and planning skills to assist families and individuals to become self-sufficient in family financial management.

**HD FS 589L: Financial Counseling Laboratory**

(Dual-listed with HD FS 489L). (0-2) Cr. 1. Repeatable, maximum of 2 credits. F.

*Prereq:* HD FS 489L: HD FS 283, HD FS 589: Graduate classification

Hands-on financial counseling experience using preventative, remedial, and productive strategies in one-on-one and/or group situations. Students work with clients to develop diverse and inclusive decision-making and problem-solving methods to achieve goals or to remove barriers.

**HD FS 590: Special Topics**

Cr. arr. Repeatable.

*Prereq:* Permission of instructor

Consult department office on procedure for filing a written plan of study.

**HD FS 590I: Special Topics: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq:* Permission of instructor

Consult department office on procedure for filing a written plan of study.

**HD FS 590R: Special Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* Permission of instructor

Consult department office on procedure for filing a written plan of study.

**HD FS 591: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* 10 graduate credits

Supervised experience in an area of human development and family studies.

**HD FS 591I: Internship: Human Development and Family Studies**

Cr. arr. Repeatable. F.S.SS.

*Prereq:* 10 graduate credits

Supervised experience in an area of human development and family studies.

**HD FS 593: Workshop**

(Dual-listed with HD FS 493). Cr. arr. Repeatable. F.S.SS.

*Prereq:* Senior classification

Workshop in HD FS.

**HD FS 594: Professional Seminar in Gerontology**

(Cross-listed with GERON). (3-0) Cr. 3. SS.

An integrative experience for gerontology students designed to be taken near the end of the degree program. By applying knowledge gained in earlier coursework, students will strengthen skills in ethical decision-making behavior, applying these skills in gerontology-related areas such as advocacy, professionalism, family and workplace issues. Students from a variety of professions will bring their unique perspectives to bear on topics of common interest.

**HD FS 599: Creative Component**

Cr. arr. F.S.SS.

*Prereq:* 9 graduate credits in HD FS

Nonthesis creative component (e.g., a special report, capstone course, integrated field experience, annotated bibliography, research project, design, or other creative endeavor).

**Courses for graduate students:****HD FS 603: Advanced Quantitative Methods**

(3-0) Cr. 3. F.

*Prereq:* HD FS 503, HD FS 505; STAT 402 or STAT 404 or permission of instructor

Methodological and analytical issues in research in human development and family studies. Advanced research design and measurement, selection of statistical techniques, and issues in the interpretation of findings.

**HD FS 604: Advanced Qualitative Methods**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 504 or permission of instructor*

Research methodologies including phenomenology, grounded theory, ethnography, and case studies. Methods of data collection and analysis procedures. Issues of ethics and interpretation of findings. (on-line course offering via Distance Education).

**HD FS 605: Multi-level Modeling**

(Cross-listed with PSYCH). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 503 and HD FS 505 or STAT 404 or permission of instructor*

Rationale for and interpretation of random coefficient models. Strategies for the analysis of multi-level and panel data including models for random intercepts, random slopes, and growth curves.

**HD FS 606: Advanced Structural Equation and Longitudinal Modeling**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 603 or STAT 404 or permission of instructor*

Rationale for and interpretation of advanced structural equation modeling for the analysis of longitudinal data. Emphasis will be placed on developing a working familiarity with some of the common statistical procedures, coupled with their application through the use of statistical software.

**HD FS 607: Mixed Methods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 503, HD FS 504, HD FS 505, or permission of instructor*

Foundations of mixed methods research, controversies, and philosophical concerns. Rationale for and interpretation of mixed methods designs. Research design, sampling, data collection, data analysis, results, and interpretation. (on-line course offering via Distance Education).

**HD FS 608: Grant Writing for Research**

(3-0) Cr. 3. F.

*Prereq: HD FS 503, HD FS 505, and HD FS 504 or permission of instructor*

Understand how to identify funding sources as well as the fundamental components of a federal research grant proposal such as the abstract or summary, background and significance, specific aims/goals and objectives, project design and methods, sustainability, assessment, broader impacts, dissemination, budget, budget justification, and cover letter.

**HD FS 616: Seminar**

Cr. arr.

May be repeated. F.S.SS.

**HD FS 631: Child Health and Development**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Young children's cognitive, physical, communication, and social-emotional health and development will be examined. Both typical and atypical trajectories will be explored. Research on current trends in the field will be emphasized. (on-line course offering via Distance Education).

**HD FS 632: Behavioral Interventions in Early Childhood**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Issues related to behavioral development and needs of children ages 3-8. Design and implementation of group and individual behavioral interventions. Discussion of coaching strategies to improve intervention implementation. (on-line course offering via Distance Education).

**HD FS 633: Infant Mental Health**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Examination of the individual, interpersonal, and familial factors that influence infant (birth through age 3) mental health. Analysis of the risk and protective factors that influence these systems and their potential effects on social-emotional development. Current issues relating to effective programs for improving parent-infant interactions and additional supports available to families. (on-line course offering via Distance Education).

**HD FS 634: Adolescent and Emerging Adult Health and Development**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Theory and research on biopsychosocial, cognitive, physical and sexual health and development from early adolescence to emerging adulthood. Contexts of development including families, peers, schools, neighborhoods, romantic relationships, economics and public policies are considered. (on-line course offering via Distance Education).

**HD FS 635: Adult Development, Aging, and Health**

(Cross-listed with GERON). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor*

Review of the impact of the growing older adult population as well as individual development and aging on individuals, families, and society. Exploration of theoretical perspectives applied to adult development and aging and distinction of normative and non-normative changes in adulthood. Discussion of methods to assess development across adulthood and consideration of the role of individual and environmental factors impacting efforts to optimize adult development.

**HD FS 640: Biomarkers and Family Research**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 510 or permission of instructor.*

Research on the biological underpinnings of human development and the biobehavioral health of the family. Exposure to interdisciplinary research and practice on biomarkers in the family, with particular emphasis on health-and well being-related measures. Application of biomarker collection, measurement, analysis and dissemination.

**HD FS 690: Advanced Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor and enrollment in Ph.D. program***HD FS 690I: Advanced Topics: Human Development and Family Studies**

Cr. arr. Repeatable.

*Prereq: Permission of instructor and enrollment in Ph.D. program***HD FS 691: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in the following specified areas.  
Offered on a satisfactory-fail basis only.

**HD FS 691A: Internship: College Teaching**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in college-level teaching. Offered on a satisfactory-fail basis only.

**HD FS 691B: Internship: Research**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in conducting research. Offered on a satisfactory-fail basis only.

**HD FS 691D: Internship: Professional Experience**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Supervised practice and experience in relevant professional experiences.  
Offered on a satisfactory-fail basis only.

**HD FS 699: Research**

Cr. arr. Repeatable.

Thesis and dissertation research. Offered on a satisfactory-fail basis only.

**HD FS 699I: Research: Human Development and Family Studies**

Cr. arr. Repeatable.

Thesis and dissertation research. Offered on a satisfactory-fail basis only.

## Human Sciences (H SCI)

Human Sciences courses provide integrative study and enriching experiences in areas that cut across the diverse curricula of the College of Human Sciences. These may include such areas as leadership, global understanding, social justice/responsibility, and ethics. Students in any college may take these courses.

***Any experimental courses offered by H SCI can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****H SCI 110: Orientation and Human Sciences Career Exploration**

(2-0) Cr. 2. F.S.

Orientation and adjustment to the university and college; review of policies and procedures; academic resources; and course selection and planning. Comprehensive approach to career development; intensive self-analysis; and in-depth examination of majors in Human Sciences. Required for all students declared as an Undecided major in the College of Human Sciences.

**H SCI 150: Dialogues on Diversity**

(1-0) Cr. 1. F.S.

An exploration of diversity within the context of the Iowa State University community through understanding human relations issues.

**H SCI 301: Introduction to Global Human Sciences**

(1-0) Cr. 1. F.

Introduction to global aspects of human sciences disciplines. Emphasis on the core conceptual dimensions of global citizenship and how they connect to becoming a human scientist. Development and application of critical skills for civic literacy in a global context. Examination of global issues; connections among global, national, and local issues; and collaborative actions to find solutions to global challenges.

Meets International Perspectives Requirement.

**H SCI 302: Global Human Sciences Capstone**

(2-0) Cr. 2. S.

*Prereq: AESHM 421; H SCI 301*

Capstone experience for the Global Human Sciences Minor. Continued focus on global aspects of human sciences disciplines, global citizenship, critical skills for civic literacy, and becoming a human scientist. Development and public presentation of a creative component that represents the culmination of international experiences gained through the minor.

Meets International Perspectives Requirement.



**H SCI 398: Cooperative Education**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Permission of CHS Career Services*

For use for cooperative education students seeking full-time status while on internship. Students must register for this course prior to commencing each work period. No more than three credits may be taken in addition to H SCI 398 during any given semester. Course cannot be used to fulfill degree requirements. Therefore, this cannot be used for a required, academic internship. Offered on a satisfactory-fail basis only. This course cannot be used to fulfill degree requirements.

**H SCI 490: Independent Study**

Cr. 1-4.

*Prereq: Permission of Instructor*

**H SCI 490E: Entrepreneurship**

Cr. 1-4.

*Prereq: Permission of Instructor*

## Immunobiology (IMBIO)

***Any experimental courses offered by IMBIO can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

### Courses for graduate students:

**IMBIO 602: Current Topics Workshop in Immunology**

(1-0) Cr. 1. Repeatable. F.

Lectures provided by off-campus experts. Students are required to participate in discussion sessions with lecturers.

**IMBIO 604: Seminar in Immunobiology**

(1-0) Cr. 1. Repeatable. S.

Student and faculty presentation.

**IMBIO 661: Comparative Immunology and Infectious Disease**

(Cross-listed with V PTH). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Graduate level Immunology or Permission of Instructor*

Discuss and define similarities and differences of varied host responses to infectious challenge. Learning will focus on comparative aspects of the host response and the unique aspects of immunity from different organisms, while highlighting molecular and mechanistic similarities of pathogen recognition, response and resolution.

**IMBIO 690: Special Topics**

Cr. arr. Repeatable.

Advanced study of specific topics in specialized field of immunobiology.

**IMBIO 697: Graduate Research Rotation**

Cr. arr. Repeatable.

Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Immunobiology major.

**IMBIO 699: Research**

Cr. arr. Repeatable.

## Industrial Design (IND D)

***Any experimental courses offered by IND D can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

### Courses primarily for undergraduates:

**IND D 201: Industrial Design Studio I**

(0-12) Cr. 6. F.

*Prereq: Enrollment in IND D major*

This is the first studio in the program introducing students to the industrial design process by focusing on the fundamentals of problem solving, critical thinking, basic market research and subsequent idea generation, emphasizing on sketching, experimentation, model making, visual and physical communication, and presentation.

**IND D 202: Industrial Design Studio II**

(0-12) Cr. 6. S.

*Prereq: Enrollment in IND D major; IND D 201*

Through a series of exercises, the second studio in the program advances students' skills in sketching, modeling and visual, physical and communication skills required for industrial design practice. Students will be implementing the use of new technologies in digital drawing, computer aided design (CAD) and analog and digital fabrication.

**IND D 210: Fundamentals of Industrial Design**

(3-0) Cr. 3.

Introduction to the discipline of Industrial Design: its definition, scope and basic principles of the profession as a whole. Overview of technical, artistic and social context of the profession.

**IND D 220: Concepts of Sketching and Making I**

(1-4) Cr. 3.

Introduction to basic tools and techniques used in different phases of the industrial design process. This course is the first in a series of two addressing key aspects of analog and digital communication tools and fundamentals of prototyping from different modes of sketching to physical sketch models.

**IND D 240: Digital Tools For Industrial Design**

(3-0) Cr. 3.

Introduction of digital applications and workflows through the lens specific to industrial design tasks and professional practices.

**IND D 250: Activity-Centered Industrial Design**

(3-0) Cr. 3.

Introduction to design for complex and dynamic situations that include people, products, activities and environments. Emphasizes the relationship between internal and external factors that impact pleasure and performance in these systems. Includes an overview of human diversity and examines the role of the industrial designer in developing the artifacts of daily activity.

**IND D 260: Design engineering: From Thought to Thing**

(3-0) Cr. 3.

What is making, building, constructing, engineering and technology and their roles for industrial design? Investigation of making techniques, engineering methods and technological advancements through case studies of everyday objects. Exploration of questions about the impact of materials choice and technologies of fabrication. Modeling, prototyping capabilities, and constructing a par with the engineering realm. Application of construction methods to industrial design in an inclusive "makers-lab" environment.

**IND D 280: History of Industrial Design**

(3-0) Cr. 3.

Introduction to contemporary and historic factors influencing industrial design craft and practice. Discussion of social, political, cultural and technological context for industrial design.

**IND D 301: Industrial Design Studio III**

(0-12) Cr. 6. F.

*Prereq: Enrollment in IND D major; IND D 202*

Exploration and application of systematic design methodology including sustainable practices and integration of creative thinking techniques through a sequence of progressive exercises.

**IND D 302: Industrial Design Studio IV**

(0-12) Cr. 6.

*Prereq: (Enrollment in IND D major; IND D 301) OR Permission of Instructor*

Exploration of commercial factors in industrial design. Meets Industrial Design Experiential Learning Requirements.

**IND D 320: Design Research Methods**

(3-0) Cr. 3.

Qualitative and quantitative methods with an emphasis on contextual user-centered research. Integration of user data collection, visualization, and synthesis as a source for design.

**IND D 330: Creative Thinking in Design**

(3-0) Cr. 3.

Exploration and practice of strategies, methods, facilitation, and processes associated with creative thinking skills and problem solving. Investigation of the nature of creativity and its implications in different contexts.

**IND D 340: Digital Design Technologies**

(0-6) Cr. 3.

Emphasis on computer-aided visualization techniques for 3D rendering and digital fabrication. Exploration and practice of several computer modeling applications as digitization tools for industrial design.

**IND D 350: Applied Human Factors Lab**

(0-1) Cr. 1.

Theory and application of human factors issues in the industrial design field, specifically their impact on the relationship of the user, the product, the product systems, and environment.

**IND D 360: Materials and Processes for Industrial Design**

(3-0) Cr. 3.

Introduction to materials and manufacturing methods for mass production and distribution of products including design for assembly and disassembly.

**IND D 370: STEM literacy: How Things Work**

(3-0) Cr. 3.

Dismantling mysteries surrounding science and technology. Identifying key concepts from applied science, engineering and technology to obtain better understanding on how things work. Review and explanation of the principles behind the technologies that define our modern way of life. Common everyday technology such as building electronic gadgets, interface hardware with computers, writing applications, systems applications and making functional electronics units, are some of the examples illustrating scientific knowledge and applications.

**IND D 380: History and Culture of Objects**

(3-0) Cr. 3.

Critical examination of meanings of objects from the perspectives of history, design, material culture, philosophy and cultural studies. Discussion of social, political, cultural and technological context for industrial design.

**IND D 397: Industrial Design Internship**

(0-12) Cr. 1-6. Repeatable, maximum of 12 credits.

*Prereq: Enrollment in IND D major; IND D 202; 18 credits in IND D; Permission of Instructor*

Professional industrial design, off-campus experience. Meets Industrial Design Experiential Learning Requirements.

**IND D 401: Industrial Design Studio V: Commercial Practices**

(0-12) Cr. 6. Repeatable, maximum of 18 credits.

*Prereq: Enrollment in IND D major; IND D 301*

Advanced topics focused on industrial design applications in commercial industries. Topics vary each time offered. Meets Industrial Design Experiential Learning Credits.

**IND D 402: Industrial Design Studio: Design for Social Impact**

(0-12) Cr. 6. F.S.SS.

*Prereq: Enrollment in IND D major; IND D 301*

Advanced topics focused on industrial design applications in service-learning and community engagement projects. Topics vary each time offered.

**IND D 435: Strategic Design: Project Management**

Cr. 3.

Review and development of executable strategies for entrepreneurial, commercial and business efforts. Focus on strategic thinking, economics of innovation, tactical approaches and effective measures in order to integrate a full cycle of product/service development. Advanced technical design processes, design management, decision-making and value proposition.

**IND D 440: Portfolio and Professional Practice**

(1-4) Cr. 3.

*Prereq: Enrollment in IND D major; IND D 301*

Discussion of industrial design practices, job market and career roadmap planning. Development and preparation of personal promotional materials for a range of media, including professional websites, personal brand, resumes, cover letters, business cards, print and/or digital portfolios.

**IND D 460: Product Realization**

(3-0) Cr. 3.

*Prereq: Enrollment in IND D major; IND D 202*

Advanced techniques of prototyping and model making for industrial design, using materials and manufacturing methods for product development. Exploration of the stages of design fabrication, systems-level implementation, testing, and constructing a par with the engineering realm. Use of typical prototyping materials, such as foam, wood, metal, plastic, plus new and emerging materials; CNC and 3D printing technologies will also be applied. Coupling the "makers-lab" movement with design entrepreneurship, development of advanced functional models and high-fidelity prototypes.

**IND D 490: Special Topics**

Cr. 1-6. Repeatable, maximum of 18 credits. F.S.SS.

*Prereq: Permission of Instructor*

Advanced topics focused on industrial design applications. Topics vary each time offered. A. Theory, Criticism, Methodology; B. Experimental Techniques; C. Three Dimensional Design; D. Distributed Collaboration.

**IND D 490A: Special Topics: Theory, Criticism, Methodology**

Cr. 1-6. Repeatable, maximum of 18 credits.

*Prereq: Permission of Instructor*

Advanced topics focused on theory, criticism, and methodologies in industrial design applications.

**IND D 490B: Special Topics: Experimental Techniques**

Cr. 1-6. Repeatable, maximum of 18 credits.

*Prereq: Permission of Instructor*

Advanced topics focused on industrial design applications. Topics vary each time offered.

**IND D 490C: Special Topics: Three-Dimensional Design**

Cr. 1-6. Repeatable, maximum of 18 credits.

*Prereq: Permission of Instructor*

Advanced topics focused on distributed collaboration in industrial design applications. Topics vary each time offered.

**IND D 490D: Special Topics: Distributed Collaboration**

Cr. 1-6. Repeatable, maximum of 18 credits.

*Prereq: Permission of Instructor*

Advanced topics focused on distributed collaboration in industrial design applications. Topics vary each time offered.

**IND D 495: Study Abroad Option**

Cr. 1-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Enrollment in IND D major; IND D 202; Permission of Instructor*

Special topics in Industrial Design, design history, environmental design, historic and contemporary practice. Travel to relevant countries. General cultural and historical studies, topical projects, and individual inquiry. Courses may be taught by departmental faculty or faculty from approved Iowa State Study Abroad programs. See current offerings for detailed syllabus. Meetings industrial design experiential credit requirements.

**IND D 499: Senior Project**

(0-12) Cr. 6.

*Prereq: Enrollment in IND D major; (IND D 401, IND D 397, or IND D 495);*

*Senior classification in IND D*

Advanced practice in specialized area of industrial design. Topics vary.

**Courses primarily for graduate students, open to qualified undergraduates:**

**IND D 501: Industrial Design Graduate Studio I**

(0-12) Cr. 6.

*Prereq: Senior or graduate standing*

Fundamental concepts, design processes, and techniques for industrial design. Emphasis on project-based application of design models and procedures for form development, structure, function and communication.

**IND D 502: Industrial Design Graduate Studio II**

(0-12) Cr. 6.

*Prereq: Graduate standing*

Advanced project-based application of industrial design theories and techniques. Emphasis on service and systems design, and its implications for community and social innovation. Application of entrepreneurial factors and systematic design methodology of complex design problems and innovative solutions.

**IND D 505: MInD Lab I**

(1-4) Cr. 3. Repeatable, maximum of 2 times.

Workshop training sessions based on project-based themes of industrial design: weekly series of 'how-tos' and other practical demos regarding fundamentals, concepts and techniques of Design. Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**IND D 507: Industrial Design Practicum**

(0-12) Cr. 6. Repeatable.

*Prereq: Evidence of satisfactory experience in area of specialization; admitted by application and written permission of instructor only.*

Studio project focused on topics generated with external partners. Topics vary. Meets Industrial Design Experiential Learning Requirements.

**IND D 510: MInD Lab II**

(1-4) Cr. 3. Repeatable, maximum of 2 times.

Advanced workshop training sessions on application of industrial design concepts and skills: emphasis on executive demos on design thinking, service and system design, and its implications for the community and industry outreach. Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**IND D 515: Graduate Colloquium**

(1-0) Cr. 1. Repeatable.

*Prereq: Graduate standing*

Presentation and discussion of creative practices carried out in various design disciplines and their relationship to industrial design. Seminar sessions focusing on exemplary pieces of: design research undertaken by faculty; design education and learning pedagogies in design; and/or cross-disciplinary graduate work in design-related fields.

**IND D 520: Design Theory Methodology**

(3-0) Cr. 3.

*Prereq: Senior or graduate standing.*

Synthesis of methodological work in products of design. Theoretical framework that integrates in-depth concepts related to design activity, design science, research philosophies, cognitive models and cognitive biases, design processes from different fields, advanced creativity studies and problem reframing. User-centered research methods to examine the impact of design on humans, environments, and social contexts. Examination and critique of current research methods employed in industrial design, service design, design for interaction and user experience (UX) design.

**IND D 530: Design Thinking**

(3-0) Cr. 3.

*Prereq: Senior or graduate standing in any ISU program*

Exploration of design thinking process, toolkits, and mindsets as creative problem solving approaches for systems, products, and processes, across diverse contexts. Strategies for problem-framing, creative solutions and co-evolution process, with a focus on collaborative and interdisciplinary design to investigate real-world problems and opportunities.

**IND D 540: Design Communication**

(0-6) Cr. 3.

Emphasis on design narratives and story-telling. Exploration of creative digital media and multiple visual communication techniques which help break down complex information. Added professional development techniques such as positioning, intrapreneurship, design manifesto, design statement, client rapport, persuasive communication methods and speculative design will be applied.

**IND D 550: Human Factors: User Experience Design**

(3-0) Cr. 3.

Human factors issues and the study of relationships between the user, the product, and the human body and its physical functions. Advanced investigations of bio-mechanics, anthropometry, instrumental displays and control, and their measurement as they relate to the design process. Emphasis on experience design, user narratives, interactions and context mapping, mapping out issues of usability, design inclusivity, diversity and integrity.

**IND D 560: Change by Design: Disruptive Innovation**

(3-0) Cr. 3. F.

Exploration and execution of applied projects on civic entrepreneurship, social innovation and design activism. Through the 3 lenses of strategic, systems and critical thinking, it addresses the importance of design for social impact when applied to cases of service-learning, community-engagement, design ethics and transitional design. Change theory and management are central to examine diffusions and disruptions of innovation.

**IND D 570: Systems Thinking in Design**

(3-0) Cr. 3. F.

Emphasis on 21st Century Design Issues through systems thinking as language, problem-framing as pivoting process and transitional design as frame innovation model. Exploration of interconnected and dynamic 21st century global issues, where complexity and future industries play a key role. Issues such as societal transitions, loss of biodiversity and climate change, circular economy, eco-centric design, aging, equity, mobility, robotics, cybernetics, etc. are discussed and mapped out for industrial design applications.

**IND D 580: Material Culture and Values**

Cr. 3. S.

Examination of the meanings of objects from the perspectives of design, material culture, philosophy and cultural studies. Critically examine the role of objects in everyday life. Concepts include: value of things, semiotics, object fetishism, product semantics, consumer value and production labor. Case studies of historic and contemporary objects will be discussed to understand key theoretical concepts and to make meaningful connection between theory and everyday objects.

**IND D 590: Special Topics**

(1-12) Cr. 1-6. Repeatable, maximum of 18 credits. F.S.SS.

*Prereq: Completion of industrial design studio or permission of instructor.*

Advanced topics focused on industrial design applications. Topics include theory, criticism, methodology, experimental techniques, three dimensional design, distributed collaboration. Meets Industrial Design Experiential Learning Requirements.

**IND D 592: Special Projects**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Completion of industrial design studio or permission of instructor.*

Planned projects in topics related to theory, criticism, methodology, experimental techniques, three dimensional design, distributed collaboration.

**IND D 593: Experiential Learning Special Projects**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Completion of industrial design studio or permission of instructor.*

Project based topics related to theory, criticism, methodology, experimental learning, three dimensional design, distributed collaboration that supports experiential learning.

**IND D 595: Study Abroad Option**

(0-12) Cr. 6. Repeatable. F.S.SS.

*Prereq: Completion of industrial design studio or permission of instructor.*

International study abroad program. Visits to design studios, showrooms, museums and manufacturing facilities. Meets Industrial Design Experiential Learning Requirements.

**IND D 597: Internship**

(0-12) Cr. 1-6. Repeatable, maximum of 18 credits. F.S.SS.

*Prereq: 12 studio credits in INDD; Permission of Instructor*

Professional industrial design, off-campus experience. Meets Industrial Design Experiential Learning Requirements.

**Courses for graduate students:****IND D 601: Industrial Design Graduate Studio III**

(0-12) Cr. 6.

*Prereq: DSN S 501 or IND D 501*

Advanced studio-based creative component in specialized area of focus within industrial design or cross-disciplinary field. Prepares for graduate design project, culminating in a development plan, project initiation document and supporting documented inquiry.

**IND D 602: MInD Graduate Project**

(0-12) Cr. 6.

*Prereq: IND D 601*

Graduate project's creative component in specialized area of focus within industrial design or cross-disciplinary field. Culminates in a physical or digital artifact and supporting documentation such as graduate defense presentation and design process book.

**IND D 630: Critical Reflections for Thesis Preparation**

(3-0) Cr. 3. S.

*Prereq: Graduate standing*

Through the lenses of STEM literacy and critical thinking, exploration of why philosophy of science, technological and engineering literacies are connected to social justice and are related areas. Reflections on the effects of design projects on human health, social structures, and the environment, and examination of improvements in economic growth and quality of life. Case studies on the effects of Design and STEM to prepare for the formulation of graduate thesis or project topics, with proposed plan of investigations.

**IND D 640: Advanced Digital Technologies**

(1-4) Cr. 3.

Exploration of interactive technologies and digital thinking industries. Advanced concepts in computer to machine interface for manufacture, digital materiality, conversational interfaces, gamification, congruence, mixed reality AR/VR, and critical media for future industries.

**IND D 699: MInD Graduate Thesis**

(0-12) Cr. 6. Repeatable.

*Prereq: IND D 632*

Advanced research component in specialized area of focus within industrial design. Culminates in a thesis document.

## Industrial Engineering (I E)

*Any experimental courses offered by I E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****I E 101: Industrial Engineering Profession**

Cr. R. F.S.

(1-0) Introduce students to the industrial engineering profession, its scope, industrial engineering tools, and future trends. Offered on a satisfactory-fail basis only.

**I E 148: Information Engineering**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143*

Development of information solutions for engineering problems. Fundamentals of the software development process. Engineering computations and the human/computer interface. Data models and database development. Program connectivity and network applications. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count towards graduation.

**I E 222: Design & Analysis Methods for System Improvements**

(3-0) Cr. 3. S.

*Prereq: Credit or concurrent enrollment in I E 271*

Study of system improvement methods and strategies. Specific areas of lean system improvements include continuous improvement, setup reduction, workplace organization, and inventory and waste reduction. Methods and strategies to analyze and quantify the impact of changes.

**I E 248: Engineering System Design, Manufacturing Processes and Specifications**

(2-2) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (I E 101; MAT E 273); MATH 166; PHYS 231*

Introduction to metrology, engineering drawings and specifications. Engineering methods for designing and improving systems. Theory, applications, and quality issues related to machining processes.

**I E 271: Applied Ergonomics and Work Design**

(3-0) Cr. 3. S.

*Prereq: PHYS 231; PHYS 231L*

Basic concepts of ergonomics and work design. Their impact on worker and work place productivity, and cost. Investigations of work physiology, biomechanics, anthropometry, work sampling, work evaluation methods, and their measurement as they relate to the design of human-machine systems.

**I E 305: Engineering Economic Analysis**

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 166*

Economic analysis of engineering decisions under uncertainty. Financial engineering basics including time value of money, cash flow estimation, and asset evaluation. Make versus buy decisions. Comparison of project alternatives accounting for taxation, depreciation, inflation, and risk.

**I E 312: Optimization**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in MATH 267*

Concepts, optimization and analysis techniques, and applications of operations research. Formulation of mathematical models for systems, concepts, and methods of improving search, linear programming and sensitivity analysis, network models, and integer programming.

**I E 341: Production Systems**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in I E 312; STAT 231*

Introduction of key concepts in the design and analysis of production systems. Topics include inventory control, forecasting, material requirement planning, Kanban systems, project planning and scheduling including Critical Path Method (CPM) and Program Evaluation Review Technique (PERT), operations scheduling, and other production systems such as Just-In-Time (JIT), warehousing, and global supply chains.

**I E 348: Solidification Processes**

(Cross-listed with MAT E). (2-2) Cr. 3. S.

*Prereq: I E 248 and MAT E 273, or MAT E 215*

Theory and applications related to metal casting, welding, polymer processing, powder metallurgy, and composites manufacturing, and related rapid manufacturing processes.



**I E 361: Statistical Quality Assurance**

(Cross-listed with STAT). (2-2) Cr. 3. F.S.

*Prereq: STAT 231, STAT 301, STAT 326, STAT 401, or STAT 587*

Statistical methods for process improvement. Simple quality assurance principles and tools. Measurement system precision and accuracy assessment. Control charts. Process capability assessment. Experimental design and analysis for process improvement. Significant external project in process improvement.

**I E 403: Introduction to Sustainable Production Systems**

(Dual-listed with I E 503). (3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment I E 341*

Quantitative introduction of sustainability concepts in production planning and inventory control. Review of material recovery (recycling) and product/component recovery (remanufacturing) from productivity perspectives. Sustainability rubrics ranging from design and process to systems. Application to multi-echelon networks subject to forward/backward flow of material and information. Closed-loop supply chains. Comparative study of sustainable vs. traditional models for local and global production systems.

**I E 405: Advanced Engineering Economy for Complex Engineering Projects**

(Dual-listed with I E 505). (3-0) Cr. 3.

*Prereq: MATH 265, MATH 267, STAT 231 and I E 305, or permission by instructor*

Overview of engineering economic valuation and complex engineering projects. Stochastic dynamic programming for project valuation. Modeling and analysis of confounding factors of engineering projects. Integration and synthesis of valuation methodologies to complex projects. Applications to power plants, transmission networks, and satellites.

**I E 413: Stochastic Modeling, Analysis and Simulation**

(4-0) Cr. 4. F.

*Prereq: MATH 265, STAT 231*

Development of probabilistic and simulation models using a simulation language. Introduction to Markov processes and other queuing models. Application to various areas of manufacturing and service systems such as assembly, material handling, and customer queues. Fitting of statistical distributions to data. Utilization of model output towards improved decision-making.

**I E 420: Engineering Problem Solving with R**

(Dual-listed with I E 520). Cr. 3. S.

*Prereq: An introductory statistics course: Stat 231 or equivalent*

Introduction to data analytics using R programming language. Data manipulation. Exploratory data analysis via basic graphics. Basic statistical analysis including statistical tests and linear regression. R Markdown. Simulation by replicating a calculation. Conditional expressions, loops, and functions. High level data visualizations using ggplot graphics. Data extraction from text. Optimization via R build-in functions. Logistic regression. High performance computing tools. Project required for graduate credits.

**I E 430: Entrepreneurial Product Engineering**

(Cross-listed with ENGR). Cr. 3. F/Alt. S., offered irregularly.

*Prereq: Junior classification*

Process of innovative product development in both entrepreneurial and intra-preneurial settings. Define, prototype and validate a product concept based on competitive bench-marking, market positioning and customer requirement evaluation in a target market into a product design that is consistent with defined business goals and strategies. Combination of lecture, discussion, problem solving and case study review.

**I E 432: Industrial Automation**

(2-3) Cr. 3. S.

*Prereq: PHYS 232; PHYS 232L*

Overview of electrical circuit theory and its relationship to industrial control systems. Theory and application of transducers in the form of sensors and actuators, with applications in manufacturing, distribution and mechanical systems. Programmable Logic Controllers (PLC), their programming and use for automation solutions. Introduction of automated identification systems such as Radio Frequency Identification (RFID) and Bar Coding technologies.

**I E 437: Reliability and Safety Engineering**

(Dual-listed with I E 537). (3-0) Cr. 3.

*Prereq: STAT 231 or STAT 305 or STAT 587*

Mathematical basics for dealing with reliability data, theory, and analysis. Bayesian reliability analysis. Engineering ethics in safety evaluations. Case studies of accidents in large technological systems. Fault and event tree analysis.

**I E 441: Industrial Engineering Design**

(1-6) Cr. 3. F.S.

*Prereq: I E 248, I E 271, I E 361; credit or enrollment in I E 341, I E 413, and I E 448*

A large, open-ended design project related to an enterprise. Application of engineering design principles including problem definition, analysis, synthesis, and evaluation.

**I E 444: Micro/Nano Scale Additive Printing**

(Dual-listed with I E 544). (3-0) Cr. 3. F.

*Prereq: I E 348 or equivalent manufacturing engineering course*

Introduction of physical theory, design, analysis, fabrication, and characterization of micro/nano scale fabrication and manufacturing systems; introduction of micro/nano scale additive manufacturing; and deep understanding of additive printing for micro/nano scale applications. Focus on the fabrication/manufacturing of important types of microstructures used in micro/nano devices using additive printing, and the techniques and tools used to characterize them. Students are expected to finish a team project related applying additive printing experimentally or theoretically to the design of a sensor.

**I E 445: Additive Manufacturing and Rapid Production Methods**

(Dual-listed with I E 545). (3-0) Cr. 3.

*Prereq: I E 248 or similar manufacturing engineering course, MATH 265. For I E 545: Undergraduates at Senior Standing if given permission by instructor.*

Introduction to additive manufacturing and other rapid prototyping and manufacturing methodologies. Operating principles and characteristics of current and developing processes. Use of rapid prototypes in product design, development, and service. Selection of rapid prototyping and manufacturing systems, from design to mass production. Hybrid manufacturing and other integration of rapid production methods.

**I E 446: Geometric Variability in Manufacturing**

(Dual-listed with I E 546). (3-0) Cr. 3.

*Prereq: I E 348 or MAT E 216 or M E 324*

Assessment, accommodation, and control of geometric variability in manufacturing processes, specifically composites, metalcasting, welding, machining, powder metallurgy and additive processing. Techniques include the design of the component, tooling, process plan and inspection methodology.

**I E 447: Biomedical Design and Manufacturing**

(Dual-listed with I E 547). (Cross-listed with B M E). (3-0) Cr. 3.

*Prereq: Undergraduate students with three semesters or less before graduation while graduate standing for graduate students*

Exploration of biology, materials, body mechanics, manufacturing, quality control, and ethics and the intersection of these subjects as they relate to biomedical manufacturing. Study of medical data (CT, MRI, etc.) processing, biomedical design, 3D bioprinting and additive manufacturing concepts.

**I E 448: Manufacturing Systems Engineering**

(3-0) Cr. 3. S.

*Prereq: I E 248*

Fixturing and tooling requirements for manufacturing process planning, geometric dimensioning and tolerancing, computer aided inspection, cellular and flexible manufacturing, facility layout and controlled flow production.

**I E 449: Computer Aided Design and Manufacturing**

(Dual-listed with I E 549). (3-0) Cr. 3.

*Prereq: Prereq: I E 248 or similar manufacturing engineering course, MATH 265.*

Representation and interpretation of curves, surfaces and solids. Parametric curves and surfaces and solid modeling. Use of CAD software and CAD/CAM integration. Computer numerical control, CNC programming languages, and process planning.

**I E 450: Technical Sales for Engineers**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in I E 305*

Sales process methodology, techniques for building professional relationships, sales automation software, prospecting and account development, market analysis and segmentation, responding to RFQ's and RFP's in written and verbal form. Developing technical value propositions and competitive positioning, evaluating organizational decision processes and people, technical marketing strategies, sales closing strategies.

**I E 452: Introduction To Systems Engineering And Analysis**

(Cross-listed with AER E). Cr. 3. SS.

*Prereq: Junior classification in an Engineering major*

Principles of systems engineering to include problem statement formulation, stakeholder analysis, requirements definition, system architecture and concept generation, system integration and interface management, verification and validation, and system commissioning and decommissioning operations. Introduction to discrete event simulation processes. Students will work in groups to propose, research, and present findings for a systems engineering topic of current relevance.

**I E 468: Large-Scale Complex Engineered Systems (LSCES)**

(Dual-listed with I E 568). (Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: Senior classification in College of Engineering or Permission of Instructor*

Introduction to the theoretical foundation and methods associated with the design for large-scale complex engineered systems, including objective function formation, design reliability, value-driven design, product robustness, utility theory, economic factors for the formation of a value function and complexity science as a means of detecting unintended consequences in the product behavior.

**I E 470: Systems Engineering and Project Management**

(Dual-listed with I E 570). (3-0) Cr. 3.

*Prereq: Prerequisite I E 305 and course in basic statistics.*

Systems view of projects and the processes by which they are implemented. Focuses on qualitative and quantitative tools and techniques of project management. Topics will include organizational structure types; project selection methodologies; simulation and optimization; and earned value management. Case studies will be included, and a group project required.

**I E 472: Design and Evaluation of Human-Computer Interaction**

(Dual-listed with I E 572). (3-0) Cr. 3.

*Prereq: I E 271 or graduate classification*

Human factors methods applied to interface requirements, design, prototyping, and evaluation. Concepts related to understanding user characteristics, design principles, usability analysis, methods and techniques for design and evaluation of the interface. The evaluation and design of the information presentation characteristics of a wide variety of interfaces: web sites (e-commerce), mobile applications, and information presentation systems (cockpits, instrumentation, etc.).

**I E 481: e-Commerce Systems Engineering**

(Dual-listed with I E 581). (3-0) Cr. 3.

*Prereq: I E 148*

Design, analysis, and implementation of e-commerce systems. Information infrastructure, enterprise models, enterprise processes, enterprise views. Data structures and algorithms used in e-commerce systems, SQL, exchange protocols, client/server model, web-based views.

**I E 483: Data Mining**

(Dual-listed with I E 583). (3-0) Cr. 3.

*Prereq: I E 148, I E 312, and STAT 231*

Foundations of classification, data clustering and association rule mining. Techniques for data mining, with focus on tree-based methods for classification (simple trees, random forest and boosted trees), ensemble learning, optimization algorithms and deep learning with neural networks. Performance metrics and resampling methods for evaluating model quality. A computing project in R is required.

**I E 487: Big Data Analytics and Optimization**

(Dual-listed with I E 587). Cr. 3. S.

*Prereq: IE 312, Stat 231*

Optimization and statistical learning related to big data problems. Modern modeling for data-driven optimization problems and their applications in big data analytics. Algorithms for optimization and statistical learning and their implementation. Applications in manufacturing sector and service sciences.

**I E 490: Independent Study**

Cr. 1-5. Repeatable.

*Prereq: Senior classification; Permission of Instructor*

Independent study and work in the areas of industrial engineering design, practice, or research.

**I E 490H: Independent Study: Honors**

Cr. 1-5. Repeatable.

*Prereq: Senior classification; Permission of Instructor*

Independent study and work in the areas of industrial engineering design, practice, or research.

**Courses primarily for graduate students, open to qualified undergraduates:****I E 501: I E Graduate Seminar**

Cr. R. Repeatable.

*Prereq: Enrollment in graduate program in Industrial Engineering. Research presentations by internal and external scholars.*

Principles and practices for research tasks at the M.S. level including proposal writing, presentations, paper preparation, and project management. Offered on a satisfactory-fail basis only.

**I E 503: Introduction to Sustainable Production Systems**

(Dual-listed with I E 403). (3-0) Cr. 3.

*Prereq: Credit or concurrent enrollment I E 341*

Quantitative introduction of sustainability concepts in production planning and inventory control. Review of material recovery (recycling) and product/component recovery (remanufacturing) from productivity perspectives. Sustainability rubrics ranging from design and process to systems. Application to multi-echelon networks subject to forward/backward flow of material and information. Closed-loop supply chains. Comparative study of sustainable vs. traditional models for local and global production systems.

**I E 505: Advanced Engineering Economy for Complex Engineering Projects**

(Dual-listed with I E 405). (3-0) Cr. 3.

*Prereq: MATH 265, MATH 267, STAT 231 and I E 305, or permission by instructor*

Overview of engineering economic valuation and complex engineering projects. Stochastic dynamic programming for project valuation. Modeling and analysis of confounding factors of engineering projects. Integration and synthesis of valuation methodologies to complex projects. Applications to power plants, transmission networks, and satellites.

**I E 508: Design and Analysis of Allocation Mechanisms**

(3-0) Cr. 3.

*Prereq: I E 312 or MATH 307*

Market-based allocation mechanisms from quantitative economic systems perspective. Pricing and costing models designed and analyzed with respect to decentralized decision processes, information requirements, and coordination. Financial Engineering Techniques. Case studies and examples from industries such as regulated utilities, semiconductor manufacturers, and financial engineering services.

**I E 510: Network Analysis**

(3-0) Cr. 3.

*Prereq: I E 312*

Formulation and solution of deterministic network flow problems including shortest path, minimum cost flow, and maximum flow. Network and graph formulations of combinatorial problems including assignment, matching, and spanning trees. Solution algorithm design and analysis based on optimality conditions and duality.

**I E 513: Analysis of Stochastic Systems**

(3-0) Cr. 3.

*Prereq: STAT 231*

Introduction to modeling and analysis of manufacturing and service systems subject to uncertainty. Topics include the Poisson process, renewal processes, Markov chains, and Brownian motion. Applications to inventory systems, production system design, production scheduling, reliability, and capacity planning.

**I E 514: Production Scheduling**

(3-0) Cr. 3.

*Prereq: I E 312, I E 341*

Introduction to the theory of machine shop systems. Complexity results for various systems such as job, flow and open shops. Applications of linear programming, integer programming, network analysis. Enumerative methods for machine sequencing. Introduction to stochastic scheduling.

**I E 519: Simulation Modeling and Analysis**

(3-0) Cr. 3.

*Prereq: COM S 311, STAT 231 or equivalent basic stat courses*

Event scheduling, process interaction, and continuous modeling techniques. Introduction of Bayesian simulation techniques and commonly used numerical methods. Probability and statistics related to simulation parameters including run length, metrics, inference, design of experiments, variance reduction, and stopping rules. Simulation of stochastic concepts and processes. Aspects of simulation languages. A computing project in a programming language is required.

**I E 520: Engineering Problem Solving with R**

(Dual-listed with I E 420). Cr. 3. S.

*Prereq: An introductory statistics course: Stat 231 or equivalent*

Introduction to data analytics using R programming language. Data manipulation. Exploratory data analysis via basic graphics. Basic statistical analysis including statistical tests and linear regression. R Markdown. Simulation by replicating a calculation. Conditional expressions, loops, and functions. High level data visualizations using ggplot graphics. Data extraction from text. Optimization via R build-in functions. Logistic regression. High performance computing tools. Project required for graduate credits.

**I E 531: Quality Control and Engineering Statistics**

(Cross-listed with STAT). (3-0) Cr. 3.

*Prereq: STAT 401 or STAT 587; STAT 342 or STAT 447 or STAT 588*

Statistical methods and theory applicable to problems of industrial process monitoring and improvement. Statistical issues in industrial measurement; Shewhart, CUSUM, and other control charts; feedback control; process characterization studies; estimation of product and process characteristics; acceptance sampling, continuous sampling and sequential sampling; economic and decision theoretic arguments in industrial statistics.

**I E 533: Reliability**

(Cross-listed with STAT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: STAT 342 or STAT 432 or STAT 447 or STAT 478 or STAT 578 or STAT 588*

Probabilistic modeling and inference in engineering reliability; lifetime models, product limit estimator, probability plotting, maximum likelihood estimation for censored data, Bayesian methods in reliability, system reliability models, competing risk analysis, acceleration models and analysis of accelerated test data; analysis of recurrent events and degradation data; planning studies to obtain reliability data.

**I E 534: Linear Programming**

(3-0) Cr. 3.

*Prereq: I E 312*

Formulation of optimization problems as mathematical models, such as linear programming, integer programming, and multi-objective optimization. Introduction to classic optimization algorithms, such as Simplex and cutting plane algorithms. Basic concepts of duality theory and sensitivity analysis. Using computer solvers to obtain optimal solutions to optimization models.

**I E 537: Reliability and Safety Engineering**

(Dual-listed with I E 437). (3-0) Cr. 3.

*Prereq: STAT 231 or STAT 305 or STAT 587*

Mathematical basics for dealing with reliability data, theory, and analysis. Bayesian reliability analysis. Engineering ethics in safety evaluations. Case studies of accidents in large technological systems. Fault and event tree analysis.

**I E 541: Inventory Control and Production Planning**

(3-0) Cr. 3.

*Prereq: I E 341*

Economic Order Quantity, dynamic lot sizing, newsboy, base stock, and (Q,r) models. Material Requirements Planning, Just-In-Time (JIT), variability in production systems, push and pull production systems, aggregate and workforce planning, and capacity management. Supply Chain Contracts.

**I E 544: Micro/Nano Scale Additive Printing**

(Dual-listed with I E 444). (3-0) Cr. 3. F.

*Prereq: I E 348 or equivalent manufacturing engineering course*

Introduction of physical theory, design, analysis, fabrication, and characterization of micro/nano scale fabrication and manufacturing systems; introduction of micro/nano scale additive manufacturing; and deep understanding of additive printing for micro/nano scale applications. Focus on the fabrication/manufacturing of important types of microstructures used in micro/nano devices using additive printing, and the techniques and tools used to characterize them. Students are expected to finish a team project related applying additive printing experimentally or theoretically to the design of a sensor.

**I E 545: Additive Manufacturing and Rapid Production Methods**

(Dual-listed with I E 445). (3-0) Cr. 3.

*Prereq: I E 248 or similar manufacturing engineering course, MATH 265. For I E 545: Undergraduates at Senior Standing if given permission by instructor.*

Introduction to additive manufacturing and other rapid prototyping and manufacturing methodologies. Operating principles and characteristics of current and developing processes. Use of rapid prototypes in product design, development, and service. Selection of rapid prototyping and manufacturing systems, from design to mass production. Hybrid manufacturing and other integration of rapid production methods.

**I E 546: Geometric Variability in Manufacturing**

(Dual-listed with I E 446). (3-0) Cr. 3.

*Prereq: I E 348 or MATE 216 or ME 324*

Assessment, accommodation, and control of geometric variability in manufacturing processes, specifically composites, metalcasting, welding, machining, powder metallurgy and additive processing. Techniques include the design of the component, tooling, process plan and inspection methodology.

**I E 547: Biomedical Design and Manufacturing**

(Dual-listed with I E 447). (3-0) Cr. 3.

*Prereq: Undergraduate students with three semesters or less before graduation while graduate standing for graduate students*

Exploration of biology, materials, body mechanics, manufacturing, quality control, and ethics and the intersection of these subjects as they relate to biomedical manufacturing. Study of medical data (CT, MRI, etc.) processing, biomedical design, 3D bioprinting and additive manufacturing concepts.

**I E 549: Computer Aided Design and Manufacturing**

(Dual-listed with I E 449). (3-0) Cr. 3.

*Prereq: Prereq: I E 248 or similar manufacturing engineering course, MATH 265.*

Representation and interpretation of curves, surfaces and solids. Parametric curves and surfaces and solid modeling. Use of CAD software and CAD/CAM integration. Computer numerical control, CNC programming languages, and process planning.

**I E 560: Engineering Risk Analysis**

(3-0) Cr. 3.

*Prereq: Coursework in basic probability and statistics*

Overview of probabilistic risk analysis, modeling risks, and risk management. Topics include probability, influence diagrams, subjective probability assessment, fault tree analysis, decision making with uncertainty, risk perception, risk communication, and intelligent adversary. Use of Monte Carlo simulation to combine different sources of uncertainty and risk to generate probability distributions over an outcome. Application of probabilistic risk analysis to business investments, engineering systems, critical infrastructure, defense and security, and health systems.

**I E 561: Total Quality Management**

(3-0) Cr. 3.

*Prereq: Course in quality control*

Perspectives for how to analyze and implement total quality management in different organizations, to include manufacturing firms, service industries, the non-profit sector, and government agencies. Topics include the different viewpoints of quality (from the customer, workforce, and process perspective); aligning quality in an organization's goals; performance measurement; quality in supply chain management; and reliability. Some advanced statistical elements of quality control will also be discussed.

**I E 563: Engineering and Systems Management**

(3-0) Cr. 3.

*Prereq: Prerequisite I E 305 and course in basic statistics*

Introduction to engineering management concepts and examples relevant to the engineering manager today. Topics include decision trees and associated probabilities; personnel issues and challenges; working with management, client and the project team; personality types; and documents/forms that are useful for the engineering manager. Case studies, and a group project required.

**I E 564: Decision Analysis**

(3-0) Cr. 3.

*Prereq: Course in probability and statistics.*

Application of normative decision theory to problems with uncertainty and/or multiple objectives. The first decision framework will be a single-objective decision problem with uncertainty that takes into account a decision maker's attitude towards risk. The second decision framework will be a multi-criteria decision problem in which a decision maker has multiple objectives. Topics include utility theory, value of information, sensitivity analysis, value-focused thinking, cost-effectiveness analysis, influence diagrams, and behavioral decision making. Examples will be drawn from business, systems engineering and design, and government.

**I E 565: Systems Engineering and Analysis**

(Cross-listed with AER E, E E). (3-0) Cr. 3.

*Prereq: Coursework in basic statistics*

Introduction to organized multidisciplinary approach to designing and developing systems. Concepts, principles, and practice of systems engineering as applied to large integrated systems. Life cycle costing, scheduling, risk management, functional analysis, conceptual and detail design, test and evaluation, and systems engineering planning and organization. Not available for degrees in industrial engineering.

**I E 566: Applied Systems Engineering**

(3-0) Cr. 3.

*Prereq: I E 565*

Design for reliability, maintainability, usability, supportability, producibility, disposability, and life cycle costs in the context of the systems engineering process. Students will be required to apply the principles of systems engineering to a project including proposal, program plan, systems engineering management plan, and test and evaluation plan. Not available for degrees in industrial engineering.

**I E 568: Large-Scale Complex Engineered Systems (LSCES)**

(Dual-listed with I E 468). (Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: Senior classification in College of Engineering or Permission of Instructor*

Introduction to the theoretical foundation and methods associated with the design for large-scale complex engineered systems, including objective function formation, design reliability, value-driven design, product robustness, utility theory, economic factors for the formation of a value function and complexity science as a means of detecting unintended consequences in the product behavior.

**I E 570: Systems Engineering and Project Management**

(Dual-listed with I E 470). (3-0) Cr. 3.

*Prereq: Prerequisite I E 305 and course in basic statistics.*

Systems view of projects and the processes by which they are implemented. Focuses on qualitative and quantitative tools and techniques of project management. Topics will include organizational structure types; project selection methodologies; simulation and optimization; and earned value management. Case studies will be included, and a group project required.

**I E 571: Occupational Biomechanics**

(3-0) Cr. 3.

*Prereq: Course in statics such as C E 274*

Anatomical, physiological, and biomechanical bases of physical ergonomics. Anthropometry, body mechanics, strength of biomaterials, human motor control. Use of bioinstrumentation, passive industrial surveillance techniques and active risk assessment techniques. Acute injury and cumulative trauma disorders. Static and dynamic biomechanical modeling. Emphasis on low back, shoulder and hand/wrist biomechanics.

**I E 572: Design and Evaluation of Human-Computer Interaction**

(Dual-listed with I E 472). (3-0) Cr. 3.

*Prereq: I E 271 or graduate classification*

Human factors methods applied to interface requirements, design, prototyping, and evaluation. Concepts related to understanding user characteristics, design principles, usability analysis, methods and techniques for design and evaluation of the interface. The evaluation and design of the information presentation characteristics of a wide variety of interfaces: web sites (e-commerce), mobile applications, and information presentation systems (cockpits, instrumentation, etc.).



**I E 576: Human Factors in Product Design**

(3-0) Cr. 3.

*Prereq: I E 572 or I E 577*

Investigation of the human interface to consumer and industrial systems and products, providing a basis for their design and evaluation. Discussions of human factors in the product design process: modeling the human during product use; usability; human factors methods in product design evaluation; user-device interface; safety, warnings, and instructions for products; considerations for human factors in the design of products for international use.

**I E 577: Human Factors**

(3-0) Cr. 3.

*Prereq: I E 271 or graduate classification*

Physical and psychological factors affecting human performance in systems. Signal detection theory, human reliability modeling, information theory, and performance shaping applied to safety, reliability, productivity, stress reduction, training, and human/equipment interface design. Laboratory assignments related to system design and operation.

**I E 581: e-Commerce Systems Engineering**

(Dual-listed with I E 481). (3-0) Cr. 3.

*Prereq: I E 148*

Design, analysis, and implementation of e-commerce systems. Information infrastructure, enterprise models, enterprise processes, enterprise views. Data structures and algorithms used in e-commerce systems, SQL, exchange protocols, client/server model, web-based views.

**I E 582: Enterprise Modeling and Integration**

(3-0) Cr. 3.

*Prereq: 3 credits in information technology or information systems*

The design and analysis of enterprise models to support information engineering of enterprise-wide systems. Representation of system behavior and structure including process modeling, information modeling, and conceptual modeling. Applications in enterprise application integration, enterprise resource planning systems, product data management systems, and manufacturing execution systems.

**I E 583: Data Mining**

(Dual-listed with I E 483). (3-0) Cr. 3.

*Prereq: I E 148, I E 312, and STAT 231*

Foundations of classification, data clustering and association rule mining. Techniques for data mining, with focus on tree-based methods for classification (simple trees, random forest and boosted trees), ensemble learning, optimization algorithms and deep learning with neural networks. Performance metrics and resampling methods for evaluating model quality. A computing project in R is required.

**I E 585: Requirements and Architecture Engineering**

(3-0) Cr. 3.

*Prereq: 3 credits in information technology or information systems*

Principles and practices for requirements engineering as part of the product development process with emphasis on software systems engineering. Problem definition, problem analysis, requirements analysis, requirements elicitation, validation, specifications. Case studies using requirements engineering methods and techniques.

**I E 587: Big Data Analytics and Optimization**

(Dual-listed with I E 487). Cr. 3. S.

*Prereq: IE 312, Stat 231*

Optimization and statistical learning related to big data problems. Modern modeling for data-driven optimization problems and their applications in big data analytics. Algorithms for optimization and statistical learning and their implementation. Applications in manufacturing sector and service sciences.

**I E 588: Information Systems for Manufacturing**

(3-0) Cr. 3.

*Prereq: I E 148, I E 448*

Design and implementation of systems for the collection, maintenance, and usage of information needed for manufacturing operations, such as process control, quality, process definition, production definitions, inventory, and plant maintenance. Topics include interfacing with multiple data sources, methods to utilize the information to improve the process, system architectures, and maintaining adequate and accurate data for entities internal and external to the enterprise to achieve best manufacturing practices.

**I E 590: Special Topics**

Cr. 1-3. Repeatable.

Advanced study of a research topic in the field of industrial engineering.

**I E 599: Creative Component**

Cr. arr.

Offered on a satisfactory-fail basis only.

**Courses for graduate students:****I E 613: Stochastic Production Systems**

(3-0) Cr. 3.

*Prereq: I E 513*

Modeling techniques to evaluate performance and address issues in design, control, and operation of systems. Markov models of single-stage make-to-order and make-to-stock systems. Approximations for non-Markovian systems. Impact of variability on flow lines. Open and closed queuing networks.

**I E 631: Nonlinear Programming**

(3-0) Cr. 3.

*Prereq: I E 534*

Develop nonlinear models, convex sets and functions, optimality conditions, Lagrangian duality, unconstrained minimization techniques. Constrained minimization techniques covering penalty and barrier functions, sequential quadratic programming, the reduced gradient method, nonlinear control concepts.

**I E 632: Integer Programming**

(3-0) Cr. 3.

*Prereq: I E 534*

Integer programming including cutting planes, branch and bound, and Lagrangian relaxation. Introduction to complexity issues and search-based heuristics.

**I E 633: Stochastic Programming**

(3-0) Cr. 3.

*Prereq: I E 513 or STAT 447, I E 534 or equivalent*

Mathematical programming with uncertain parameters; modeling risk within optimization; multi-stage recourse and probabilistically constrained models; solution and approximation algorithms including Benders decomposition and progressive hedging; and applications to planning, allocation and design problems.

**I E 634: Computational Optimization**

(3-0) Cr. 3.

*Prereq: I E 534 or equivalent.*

Theory, algorithm, and computer implementation of optimization models. Simplex, Benders decomposition, computational complexity, mixed integer linear program, linear program with complementarity constraints, inverse optimization, bilevel discrete optimization. Open source and commercial optimization solvers will be introduced and used.

**I E 642: Simultaneous Engineering in Manufacturing Systems**

(3-0) Cr. 3.

*Prereq: I E 549 or M E 415*

Current engineering methods for the product life cycle process. Feature-based design, computer-aided process planning, and data-driven product engineering.

**I E 671: Research Practicum in Human Factors and Ergonomics**

(3-0) Cr. 3. Repeatable.

*Prereq: I E 571 or I E 577 or I E 572*

Research topic development, literature evaluation, experimental design, use of bioinstrumentation, data collection, basic data interpretation, statistical analysis, manuscript preparation.

**I E 672: Human Factors in Automation Design**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Graduate classification*

Concepts in human-automation systems, including levels of automation, types of automation, and level of control. Implications of how adaptive automation affects error, trust, workload, situation awareness, and performance. Understand how human operators are affected by automation implementation in real-world systems. Apply human factors concepts to the design and assessments of human-automation systems.

**I E 673: Spine Biomechanics**

(3-0) Cr. 3. Repeatable, maximum of 3 times. Alt. F., offered odd-numbered years.

*Prereq: I E 571 or equivalent*

Gross and fine anatomy of spine, mechanism of pain, epidemiology, in vitro testing, psychophysical studies, spine stability models, bioinstrumentation: intradiscal pressure, intra-abdominal pressure and electromyography. Biomechanics of lifting and twisting, effects of vibration, effects of posture/lifting style, lifting belts, physical models, optimization models, mathematical models, muscle models, finite element models, current trends in medical management and rehabilitation, chiropractic.

**I E 681: Cognitive Engineering**

(Cross-listed with HCI). (3-0) Cr. 3.

*Prereq: I E 572 or I E 577 or PSYCH 516 or HCI/PSYCH 521 or equivalent*

Provides an overview of human cognitive capabilities and limitations in the design of products, work places, and large systems. Contexts vary broadly and could range from simple use of mobile devices to an air-traffic control or nuclear plant command center. Course focuses on what we can infer about users' thoughts and feelings based on what we can measure about their performance and physiological state. Covers the challenge of designing automated systems.

**I E 690: Advanced Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of the instructor*

Advanced topics related to Ph.D. research in industrial engineering under the direction of the instructor.

**I E 697: Engineering Internship**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of department*

One Fall OR Spring semester combined with one summer, maximum per academic year. Excludes Fall/Spring combination. Professional work period. Offered satisfactory/fail basis only. (With Instructor Permission). Offered on a satisfactory-fail basis only.

**I E 699: Research**

Cr. arr. Repeatable.

# Integrated Studio Arts (ARTIS)

**Any experimental courses offered by ARTIS can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

## **ARTIS 201: Creative Visual Thinking**

(0-6) Cr. 3. F.S.

Exploration of the nature of visual perception in relation to issues of visual communication, problem solving, envisioning information, and visual thinking. Studio assignments to be digitized and sent to instructor electronically for evaluation and critique.

## **ARTIS 202: Studio Fundamentals: Wood**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students; sophomore level and above. Required of all ISA BFA majors*

Half-semester course. Introduction to wood's physical properties, its potential as an expressive medium, and basic wood working hand tools and techniques.

## **ARTIS 203: Studio Fundamentals: Jewelry/Metalsmithing**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students; sophomore level and above. Required of all ISA BFA majors*

Half semester course. Introduction to basic jewelry/metals design and fabrication. Forming, texturing, and joining techniques (soldering/riveting) will be explored and applied to two projects.

## **ARTIS 204: Studio Fundamentals: Ceramics**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors*

Half-semester course providing an introduction to ceramic techniques including hand-building, high fire and low fire glaze applications and expressive approaches that will be applied to two projects. The emphasis is on creative communication through ceramics.

## **ARTIS 206: Studio Fundamentals: Printmaking**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors.*

Introduction to relief, monoprint, intaglio, lithography, and screen printing as methods for visual communication and expression.

## **ARTIS 208: Color**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required for all ISA BFA majors.*

Half-semester course. Introduction to color theory and color systems using various media for visual communication and creative expression.

## **ARTIS 210: Studio Fundamentals: Photo**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors.*

Introduction to film camera operation and traditional black and white darkroom methods for visual communication and creative expression. Film cameras required for class but may be checked out for short periods during semester.

## **ARTIS 212: Studio Fundamentals: Digital Media**

(0-6) Cr. 3. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors.*

Introduction to digital media tools and concepts and digital fabrication processes to create two dimensional, three dimensional, and time-based artworks. Students will be introduced to major digital art and design software packages.

## **ARTIS 213: Studio Fundamentals: Painting**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors.*

Half-semester course. Introduction to preparation of painting grounds, color mixing, manipulation of paint and pictorial space as methods for visual communication and expression.

## **ARTIS 214: Studio Fundamentals: Textiles**

(0-8) Cr. 2. F.S.

*Prereq: Open to all students, sophomore level and above. Required of all ISA BFA majors.*

Half semester course. Introduction to two-dimensional and three-dimensional textile techniques used for visual communication and expression.

**ARTIS 227: Introduction to Creative Digital Photography**

(0-6) Cr. 3.

The functions and operations of the digital camera, scanning and other image input devices, digital image manipulation, software usage and support, color management and printing, presentation of images, compositional dynamics and the development of "seeing" as a medium of design, expression, and communication. Students should have access to a good or high quality digital camera with the ability to separately adjust shutter speed, f/stop and exposure, a laptop with updated Adobe Photoshop software, and enough digital storage for all class assignments.

**ARTIS 227H: Introduction to Creative Digital Photography: Honors**

(0-6) Cr. 3-4.

The functions and operations of the digital camera, scanning and other image input devices, digital image manipulation, software usage and support, color management and printing, presentation of images, compositional dynamics and the development of "seeing" as a medium of design, expression, and communication. Students should have access to a good or high quality digital camera with the ability to separately adjust shutter speed, f/stop and exposure, a laptop with updated Adobe Photoshop software, and enough digital storage for all class assignments.

**ARTIS 230: Drawing II**

(0-6) Cr. 3. F.S.

*Prereq: DSN S 102; DSN S 131; DSN S 183*

A continuation of DSN S 131. Further development of perceptual drawing skills from a variety of subject matter. Continued practice with drawing materials and techniques with emphasis on tonal and color media.

**ARTIS 233: Watercolor Painting**

(0-6) Cr. 3.

*Prereq: ARTIS 230*

Fundamentals of painting using water-based media applied to observation-based painting. Subject matter may include working from actual or two-dimensional references of still life, landscape, architectural space, and the human form.

**ARTIS 233H: Watercolor Painting: Honors**

(0-6) Cr. 3-4.

*Prereq: ARTIS 230*

Fundamentals of painting using water-based media applied to observation-based painting. Subject matter may include working from actual or two-dimensional references of still life, landscape, architectural space, and the human form.

**ARTIS 238: Painting I**

(0-6) Cr. 3. F.S.

*Prereq: ARTIS 230*

Fundamentals of painting using acrylic and oil media applied to observation-based painting. Subject matter may include working from actual or two-dimensional references of still life, landscape, and the human form.

**ARTIS 238H: Painting I: Honors**

(0-6) Cr. 3-4. F.S.

*Prereq: ARTIS 230*

Fundamentals of painting using acrylic and oil media applied to observation-based painting. Subject matter may include working from actual or two-dimensional references of still life, landscape, and the human form.

**ARTIS 305: Collage, Assemblage, and the Found Object**

(Dual-listed with ARTIS 505). (0-6) Cr. 3. Repeatable.

*Prereq: 6 credits of 200 level studio or permission of instructor*

Explores the significance of recycling, sustainable methods of art making, and thrift-store culture as medium and subject matter for artists in both 2D and 3D studio projects. Through selected readings, slide presentations, and studio activities, we will address the environmental cause and effect of materials and methods, consumption and waste, and personal responsibility as stewards for the planet we share. Emphasis will be on conceptual development.

**ARTIS 308: Computer Modeling, Rendering and Virtual Photography**

(0-6) Cr. 3.

Introduction to 3D modeling using computer and available software. Modeling, texturing, lighting, and rendering with respect to 3D object and still scene creation.

**ARTIS 308H: Computer Modeling, Rendering and Virtual Photography: Honors**

(0-6) Cr. 3-4.

Introduction to 3D modeling using computer and available software. Modeling, texturing, lighting, and rendering with respect to 3D object and still scene creation.

**ARTIS 310: Sources and Methods of Visual Art**

(1-4) Cr. 3.

Study and application of methods used by contemporary artists for the purpose of generating ideas for new work. Field trip.

**ARTIS 311: Contemporary Issues in Studio Art**

Cr. 3.

Exploration of issues and directions in current art. Readings, discussions, and studio research projects to build an experimental and applied knowledge base for understanding each student's place in the contemporary art world.

**ARTIS 320: Introduction to Furniture Design**

(0-6) Cr. 3.

*Prereq: ARTIS 202 or Permission of Instructor.*

Design and production of basic furniture forms in wood. Introduction to power tools. Develop an individual design process including an understanding of scale and proportion. Develop a deeper understanding of wood and the issues of sustainability in furniture design.

**ARTIS 320H: Introduction to Furniture Design: Honors**

(0-6) Cr. 3-4.

*Prereq: ARTIS 202 or Permission of Instructor.*

Design and production of basic furniture forms in wood. Introduction to power tools. Develop an individual design process including an understanding of scale and proportion. Develop a deeper understanding of wood and the issues of sustainability in furniture design.

**ARTIS 322: Intermediate Ceramics Studio**

(0-6) Cr. 3.

*Prereq: ARTIS 204 or Permission of Instructor.*

Investigation of expressive forms and techniques in ceramics; introduction to throwing on the wheel, to exploration of utilitarian and sculptural approaches in the medium, and to glaze-making research and electric kiln firing.

**ARTIS 322H: Intermediate Ceramics Studio: Honors**

(0-6) Cr. 3-4.

*Prereq: ARTIS 204 or Permission of Instructor.*

Investigation of expressive forms and techniques in ceramics; introduction to throwing on the wheel, to exploration of utilitarian and sculptural approaches in the medium, and to glaze-making research and electric kiln firing.

**ARTIS 323: Scientific Illustration Principles and Techniques**

(Cross-listed with BPM I). (0-6) Cr. 3. Repeatable.

*Prereq: DSN S 131, ARTIS 230, or equivalent, and 3 credits in biological sciences; or permission of the instructor*

Studio basics and professional techniques in black & white, continuous tone, and color. Introduction to professional practice and principles of communicating science through art. Emphasis on tools, materials, and rendering.

**ARTIS 324: Jewelry/Metalsmithing II**

(0-6) Cr. 3.

*Prereq: ARTIS 203 or Permission of Instructor*

Hands-on studio experience. Focusing on traditional and contemporary metalsmithing techniques applicable to jewelry, functional objects, and sculptural art forms. Topics include fabrication, forming and cold joinery, with an emphasis on design and progressive skill development. Basic stone setting and lost wax casting introduced.

**ARTIS 324H: Jewelry/Metalsmithing II: Honors**

(0-6) Cr. 3-4.

*Prereq: ARTIS 203 or Permission of Instructor*

Hands-on studio experience. Focusing on traditional and contemporary metalsmithing techniques applicable to jewelry, functional objects, and sculptural art forms. Topics include fabrication, forming and cold joinery, with an emphasis on design and progressive skill development. Basic stone setting and lost wax casting introduced.

**ARTIS 325: Integrated Studio Arts Seminar**

(2-0) Cr. 2. Repeatable, maximum of 6 credits.

*Prereq: Open to ISA BFA majors*

Contemporary issues in studio arts explored through lectures, presentations and critiques.

**ARTIS 326: Illustration and Illustration Software**

(Cross-listed with BPM I). (0-6) Cr. 3. Repeatable.

*Prereq: ARTIS 323 or BPM I 323 or Permission of Instructor*

An introduction to digital illustration software. Application of painting, drawing and image making techniques using vector and raster based programs.

**ARTIS 327: Illustration as Communication**

(Cross-listed with BPM I). (0-6) Cr. 3.

*Prereq: ARTIS 326 or BPM I 326 or Permission of Instructor*

Investigation of illustration as a form of communication. Emphasis on problem solving, effective composition, and advancement of rendering skills.

**ARTIS 329: Creative Photography**

(0-6) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARTIS 210 or Permission of Instructor*

Continuation and expansion of concepts and processes from introductory photography. The class begins with advanced film camera techniques and experimentation with medium format cameras. It then moves into digital and color photography while also addressing output and presentation. Emphasis will be on the use of photography for visual communication and creative expression.

**ARTIS 329H: Creative Photography, Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 6 credits.

*Prereq:* ARTIS 210 or Permission of Instructor

Continuation and expansion of concepts and processes from introductory photography. The class begins with advanced film camera techniques and experimentation with medium format cameras. It then moves into digital and color photography while also addressing output and presentation. Emphasis will be on the use of photography for visual communication and creative expression.

**ARTIS 330: Drawing III: Life Drawing**

(0-6) Cr. 3. Repeatable.

*Prereq:* ARTIS 230

Drawing from the human figure.

**ARTIS 330H: Drawing III: Life Drawing, Honors**

(0-6) Cr. 3-4. Repeatable.

*Prereq:* ARTIS 230

Drawing from the human figure.

**ARTIS 331: Alternative materials for Artist/Designer**

(3-0) Cr. 3. Repeatable. F.S.

*Prereq:* 200 level ISA studio courses, or permission of instructor

Exploration of alternative materials (primarily non-metallics, both natural and manufactured) applicable to the design and creation of small designed objects and adornment. Students will learn additive and reductive processes, experiment with found object inclusion, rubber mold-making, and resin casting. A series of finished pieces will result. Open to all majors in the College of Design.

**ARTIS 337: Application of Scientific Illustration Techniques**

(Cross-listed with BPM I). (0-6) Cr. 3. Repeatable, maximum of 6 credits. S.

*Prereq:* ARTIS 327

Rendering techniques applied to different types of biological and scientific subjects emphasizing communication. The use of traditional and digital media. Term project required.

**ARTIS 338: Painting II**

(0-6) Cr. 3. Repeatable.

*Prereq:* ARTIS 238 or ARTIS 213 and ARTIS 230

Painting using acrylic and oil media; composition and expression.

**ARTIS 338H: Painting II: Honors**

(0-6) Cr. 3-4. Repeatable.

*Prereq:* ARTIS 238 or ARTIS 213 and ARTIS 230

Painting using acrylic and oil media; composition and expression.

**ARTIS 345: Introduction to Weaving**

(0-6) Cr. 3. Repeatable.

Introduction to woven textile construction with emphasis on technical development of weaving as a means for creative expression. Students may explore tapestry, off-loom and/or 4-harness weaving.

**ARTIS 345H: Introduction to Weaving**

(0-6) Cr. 3-4. Repeatable.

Introduction to woven textile construction with emphasis on technical development of weaving as a means for creative expression. Students may explore tapestry, off-loom and/or 4-harness weaving.

**ARTIS 346: Natural Dyes**

(0-6) Cr. 3. Repeatable. F.S.

Introduction to natural dyes. Course includes a historical overview of natural dyes with attention to global perspectives. Emphasis on technical skill development and application of research in the creation of contemporary textile artwork, apparel and home furnishings.

**ARTIS 346H: Natural Dyes: Honors**

(0-6) Cr. 3-4. Repeatable. F.S.

Introduction to natural dyes. Course includes a historical overview of natural dyes with attention to global perspectives. Emphasis on technical skill development and application of research in the creation of contemporary textile artwork, apparel and home furnishings.

**ARTIS 347: Dyed and Printed Textiles**

(0-6) Cr. 3. Repeatable. F.S.

Fabric dyeing and printing techniques including block, stencil and experimental screen-printing, and resists using synthetic dyes, discharging agents, and pigments. Printing with plant-based dyes may also be explored. Digital printing and transfer printing on fabric may be introduced. Emphasis on research and development of dyed and printed textile design techniques as a means for creative expression.

**ARTIS 347H: Printed Textile Design: Honors**

(0-6) Cr. 3-4. Repeatable. F.S.

Textile hand-printing methods on fabric including block, stencil and experimental screen-printing using synthetic dyes, discharging agents and pigments. Printing with plant-based dyes will also be explored. Digital printing and transfer printing on fabric will be introduced. Emphasis on research and development of printed textile design techniques as a means for personal expression.



**ARTIS 356: Relief Printmaking: Digital/Traditional**

(Dual-listed with ARTIS 556). (0-6) Cr. 3-4. Repeatable, maximum of 6 credits. F.S.

*Prereq: For ARTIS 356: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 556: Graduate classification or instructor permission*

In-depth exploration of digital or traditional design and block cutting processes (computer/laser cutter/CNC router or drawing/chisels). Use relief printmaking to create a unified body of prints from those blocks. Emphasis is on experimental and creative use of printmaking with study of contemporary trends.

**ARTIS 356H: Relief Printmaking: Digital/Traditional, Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 6 credits. F.S.

*Prereq: ARTIS 206 and credit or enrollment in ARTIS 230, or Permission of Instructor*

Explore the techniques and aesthetic qualities of black and white and color relief printmaking with woodcuts, computer/laser cutter/CNC router blocks, or photopolymer plates. Emphasis is on experimental and creative use of printmaking with study of contemporary trends.

**ARTIS 357: Intaglio and Monotype Printmaking: Digital / Traditional**

(Dual-listed with ARTIS 557). (0-6) Cr. 3-4. Repeatable, maximum of 9 credits. F.S.

*Prereq: For ARTIS 357: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 557: Graduate classification or instructor permission*

Explore the techniques and aesthetic qualities of black and white and color intaglio printmaking primarily through etching, aquatint, laser-cut plates and collagraph processes. Students will generate imagery through traditional drawing, collage and digital processes. Unique, one-of-a-kind black and white and color prints from Plexiglas will also be introduced. Emphasis is on experimental and creative use of printmaking for artistic expression.

**ARTIS 357H: Intaglio and Monotype Printmaking: Digital / Traditional, Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission*

Explore the techniques and aesthetic qualities of black and white and color intaglio printmaking primarily through etching, aquatint, laser-cut plates and collagraph processes. Students will generate imagery through traditional drawing, collage and digital processes. Unique, one-of-a-kind black and white and color prints from Plexiglas will also be introduced. Emphasis is on experimental and creative use of printmaking for artistic expression.

**ARTIS 358: Lithography: Digital / Traditional**

(Dual-listed with ARTIS 558). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: For ARTIS 358: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 558: Graduate classification or instructor permission*

Examine the techniques and aesthetic qualities of lithography primarily through hand-drawn and photographic plates. Students may generate imagery through traditional drawing, collage or digital processes. Emphasis is on experimental and creative use of printmaking for artistic expression. For those taking the course for a second semester, focus is on stone lithography and increased work with color.

**ARTIS 358H: Lithography: Digital / Traditional, Honors**

(0-6) Cr. 3-4. Repeatable. F.S.

*Prereq: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission*

Examine the techniques and aesthetic qualities of lithography primarily through hand-drawn and photographic plates. Students may generate imagery through traditional drawing, collage or digital processes. Emphasis is on experimental and creative use of printmaking for artistic expression. For those taking the course for a second semester, focus is on stone lithography and increased work with color.

**ARTIS 399: BFA Professional Practice**

(2-0) Cr. 2. S.

*Prereq: Junior classification in ISA BFA curriculum.*

Introduction to professional practices including development of portfolio (visual and written components). Lecture and presentation topics include applying to graduate school, internships, applying for jobs, grants/funding opportunities, professional networking, exhibition opportunities, and best practices for studio artists. Half-semester course. Required of all ISA majors.

**ARTIS 407: Principles of Character Animation**

(Dual-listed with ARTIS 507). (0-6) Cr. 3. Repeatable, maximum of 9 credits.

Animation techniques using the computer and available software. Principles of character animation. Prior knowledge of modeling, lighting, texturing and rendering with available software is assumed.

**ARTIS 407H: Principles of Character Animation: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 9 credits.

Animation techniques using the computer and available software. Principles of character animation. Prior knowledge of modeling, lighting, texturing and rendering with available software is assumed.

**ARTIS 408: Principles of 3D Animation**

(0-6) Cr. 3. Repeatable.

*Prereq: ARTIS 308*

Animation techniques using the computer and available software. Principles of animation. Prior knowledge of modeling, lighting, texturing, animation and rendering with computer and available software is assumed.

**ARTIS 408H: Principles of 3D Animation: Honors**

(0-6) Cr. 3-4. Repeatable.

*Prereq: ARTIS 308*

Animation techniques using the computer and available software. Principles of animation. Prior knowledge of modeling, lighting, texturing, animation and rendering with computer and available software is assumed.

**ARTIS 409: Computer/Video Game Design and Development**

(Dual-listed with ARTIS 509). (0-6) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Permission of instructor. Programming emphasis: COM S 227, COM S 228, COM S 229 or equivalent in engineering; art or graphics emphasis: ARTIS 230 and ARTIS 308; writing emphasis: an English course in creative writing or writing screen plays; business or marketing students: Junior classification*  
Independent project based creation and development of "frivolous and non-frivolous" computer games in a cross-disciplinary team. Projects require cross-disciplinary teams. Aspects of Indie development and computer/video game history will be discussed.

**ARTIS 420: Advanced Furniture Design**

(Dual-listed with ARTIS 520). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 320*

Design and creation of increasingly complex furniture forms with consideration of precedents and innovative techniques and approaches. Continued development of a unique personal approach to the design and making of furniture. Refined sensitivity to wood, and continued consideration of various sustainable practices.

**ARTIS 420H: Advanced Furniture Design: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 320*

Design and creation of increasingly complex furniture forms with consideration of precedents and innovative techniques and approaches. Continued development of a unique personal approach to the design and making of furniture. Refined sensitivity to wood, and continued consideration of various sustainable practices.

**ARTIS 422: Advanced Ceramic Studio**

(Dual-listed with ARTIS 522). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: For ARTIS 422: ARTIS 322. For ARTIS 522: graduate classification in the MFA program in Integrated Visual Arts; or permission of instructor*  
Creation of a body of work in personal ceramic forms and unique surface treatments. Exploration of kiln firings, research into contemporary ceramic artists and development of a body of increasingly skilled work are emphasized. Students are expected to be capable of independent studio work and take responsibility for firings.

**ARTIS 422H: Advanced Ceramic Studio: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 322*

Creation of a body of work in personal ceramic forms and unique surface treatments. Exploration of kiln firings, research into contemporary ceramic artists and development of a body of increasingly skilled work are emphasized. Students are expected to be capable of independent studio work and take responsibility for firings. Honors project developed with supervision from instructor.

**ARTIS 424: Jewelry/Metalsmithing III**

(Dual-listed with ARTIS 524). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 324 or Permission of Instructor*

Hands-on studio experience. Focusing on traditional and contemporary metalsmithing techniques applicable to jewelry, functional objects, and sculptural art forms. Topics include fabrication, forming and cold joinery, with an emphasis on design and progressive skill development. Basic stone setting and lost wax casting introduced.

**ARTIS 424H: Jewelry/Metalsmithing III: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 324 or Permission of Instructor*

Hands-on studio experience. Focusing on traditional and contemporary metalsmithing techniques applicable to jewelry, functional objects, and sculptural art forms. Topics include fabrication, forming and cold joinery, with an emphasis on design and progressive skill development. Basic stone setting and lost wax casting introduced.

**ARTIS 429: Advanced Photography**

(Dual-listed with ARTIS 529). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: ARTIS 329*

Independent, advanced work in traditional alternative and/or digital photographic processes. Emphasis is on development of a unified body of work and research into contemporary photographers and aesthetic concern.

**ARTIS 429H: Advanced Photography: Honors**

(0-6) Cr. 3-4. Repeatable. F.S.

*Prereq: ARTIS 329*

Independent, advanced work in traditional alternative and/or digital photographic processes. Emphasis is on development of a unified body of work and research into contemporary photographers and aesthetic concern.

**ARTIS 430: Drawing IV**

(Dual-listed with ARTIS 530). (0-6) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 330*

Figurative and/or non-figurative drawing with advanced work in media, composition, and theory.

**ARTIS 430H: Drawing IV: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 330*

Figurative and/or non-figurative drawing with advanced work in media, composition, and theory.

**ARTIS 431: Character and Scene Design**

(Dual-listed with ARTIS 531). Cr. 3. F.

*Prereq: For ARTIS 431: DSN S 131, plus ARTIS 230, ARTIS 330, or instructor permission after portfolio review. For ARTIS 531: Graduate classification in the MFA program in Integrated Visual Arts; or instructor permission after portfolio review.*

Drawing directed toward designing characters and environments to be used for telling stories in a variety of contexts. Emphasis on ideation, research, concept art and other process work over finished art.

**ARTIS 432: Sequential Narrative Drawing**

(Dual-listed with ARTIS 532). (0-6) Cr. 3. S.

*Prereq: For ARTIS 432: DSN S 131, plus ARTIS 230, ARTIS 330, or instructor permission after portfolio review. For ARTIS 532, Graduate classification in the MFA program in Integrated Visual Arts; or instructor permission after portfolio review.*

Studio course in drawing focusing on the fundamentals of communicating a narrative through sequential images in a variety of applications. Emphasis will be placed on visual research, ideation, concept art and process sketching.

**ARTIS 438: Painting III**

(Dual-listed with ARTIS 538). (0-6) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 338*

Figurative and non-figurative painting with advanced work in media, composition, and theory.

**ARTIS 438H: Painting III: Honors**

(0-6) Cr. 3-4. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 338*

Figurative and non-figurative painting with advanced work in media, composition, and theory.

**ARTIS 447: Dyed and Printed Textiles**

(Dual-listed with ARTIS 547). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: For ARTIS 447: ARTIS 347 or permission of instructor; For ARTIS 547: Graduate classification.*

Fabric dyeing and printing techniques including block, stencil and experimental screen-printing, and resists using synthetic dyes, discharging agents, and pigments. Printing with plant-based dyes may also be explored. Digital printing and transfer printing on fabric may be introduced. Emphasis on research and development of dyed and printed textile design techniques as a means for creative expression.

**ARTIS 448: Digital Textile Design**

(Dual-listed with ARTIS 548). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: Junior classification in either College of Design or Apparel, Merchandising, Design*

This hands-on studio course will allow students to explore digital printing technology and its application to textile design for those working within industry as well as independent studio practitioners. Digital design development includes pattern repeats and photo manipulation to create unique textile designs for fashion, interior and fine art applications.

**ARTIS 458: Advanced Printmaking**

(0-6) Cr. 3. Repeatable. F.S.

*Prereq: ARTIS 356, ARTIS 357, or ARTIS 358, and Permission of Instructor*  
Independent, advanced work in printmaking processes. Emphasis is on development of a unified body of work and research into contemporary artists.

**ARTIS 458H: Advanced Printmaking: Honors**

(0-6) Cr. 3-4. Repeatable. F.S.

*Prereq: ARTIS 356, ARTIS 357, or ARTIS 358, and Permission of Instructor*  
Independent, advanced work in printmaking processes. Emphasis is on development of a unified body of work and research into contemporary artists.

**ARTIS 460: Sustainable Design and Fabrication of Furniture**

(0-6) Cr. 3. F.S.

*Prereq: Senior standing or Permission of Instructor*

Issues in the design and fabrication of furniture focusing on sustainable practices. An exploration of current practices and their environmental effects, consumer demands, and alternative processes and materials.

**ARTIS 462: Community-Engaged Arts Management.**

(1-4) Cr. 3. F.S.

Introduction to aspects of community arts management and art gallery operations. Class meets at ISU Design on Main Gallery, a community arts space in the Main Street Cultural District of Ames. Students will staff the gallery and assist in the conception, design and realization of exhibitions.

**ARTIS 465: Artists, Designers and Sustainable Development**

(0-6) Cr. 3. S.

*Prereq: ARTIS 465: Senior standing or permission of instructor. ARTIS 565X: Graduate standing*

The artist/designer's role in sustainable development with a focus on cultural understanding of the collaborating communities. Class discussion, visual exercises, and the creation of creative collaborative service-learning projects such as product design, habitat design, and visual arts projects. Preorientation for travel to Ghana in ARTIS 466/566X. Meets International Perspectives Requirement.

**ARTIS 466: Studio Abroad: Africa**

(0-6) Cr. 3. SS.

*Prereq: ARTIS 465 or Permission of Instructor*

Traveling studio to Africa; an experiential tour of arts and history combined with design-focused collaborative service-learning projects. Projects may include product development, design consultation, sustainable building design, and learning and teaching of visual arts. Student teams will develop projects in partnership with in-country nationals.

Meets International Perspectives Requirement.

**ARTIS 473: Video Art**

(Dual-listed with ARTIS 573). (0-6) Cr. 3.

*Prereq: ARTIS 212 or permission of instructor for enrollment in ARTIS 473; graduate standing or permission of instructor for enrollment in ARTIS 573*

Usage of professional video editing software and application of best practices for video production and post-production to realize original artworks. Creation of narrative and non-narrative videos and site specific video installations. Prominent examples in the history of video art provide context for the coursework. Non-repeatable for graduate students.

**ARTIS 475: Interactive Art**

(Dual-listed with ARTIS 575). (0-6) Cr. 3.

*Prereq: For ARTIS 475: ARTIS 212 or Permission of Instructor; for ARTIS 575: Graduate standing or permission of instructor.*

Create software and integrate the sensors required to create interactive artworks, video games, and installations. Prominent examples in the history of interactive art provide context for the coursework.

**ARTIS 482: Selected Topics in Studio Art**

(Dual-listed with ARTIS 582). Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of Instructor*

Special issues related to studio art. Topics vary each time offered.

**ARTIS 490: Independent Study**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed craft design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490B: Independent Study: Ceramics**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490C: Independent Study: Computer Art and Design**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490D: Independent Study: Drawing**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490E: Independent Study: Textiles**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490F: Independent Study: Illustration**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490G: Independent Study: Metals**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490H: Independent Study: Honors**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490I: Independent Study: Painting**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490J: Independent Study: Photography**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490K: Independent Study: Printmaking**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490L: Independent Study: Furniture**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 490M: Independent Study: Mixed Media**

Cr. 1-6. Repeatable.

*Prereq: Written approval of instructor and department chair on required form in advance of semester of enrollment*

Student must have completed coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTIS 491: Post Baccalaureate Capstone Course**

Cr. 1. F.S.

*Prereq: Enrollment in Integrated Studio Arts Post Baccalaureate*

Exhibition of artwork completed in the Post Baccalaureate program, required for fulfillment of certificate. Offered on a satisfactory-fail basis only.

**ARTIS 493: Workshop**

Cr. 1-3. Repeatable. SS.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493B: Workshop: Ceramics**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493C: Workshop: Computer Art and Design**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493D: Workshop: Drawing**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493E: Workshop: Textiles**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493F: Workshop: Illustration**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493G: Workshop: Metals**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.



**ARTIS 493H: Workshop: Honors**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493I: Workshop: Painting**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493J: Workshop: Photography**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493K: Workshop: Printmaking**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493L: Workshop: Furniture**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 493M: Workshop: Mixed Media**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 494: Integrated Studio Arts in Europe Seminar**

(1-0) Cr. 1.

*Prereq: Permission of instructor and planned enrollment in ARTIS 495*

Cultural and historical aspects of art and design in Western Europe in preparation for study abroad. Area of study varies each time offered. Offered on a satisfactory-fail basis only. Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

**ARTIS 495: Integrated Studio Arts in Europe**

(Dual-listed with ARTIS 595). Cr. 3.

*Prereq: Graduate classification, ARTIS 494 or equivalent, permission of instructor*

International study abroad program in western Europe. Visits to design studios, art museums, and educational facilities. Related activities depending on specific area of study which may vary each time offered. Meets International Perspectives Requirement.

**ARTIS 496: Art and Design Field Study**

Cr. R. Repeatable.

*Prereq: Concurrent enrollment in an art and design studio or integrated studio arts course and permission of instructor*

Study and tours of museums, galleries, artist and/or designer studios and other areas of interest within art and design. Offered on a satisfactory-fail basis only.

**ARTIS 497: Studio Internship**

Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: Advanced classification in a department curriculum*

Written approval of supervising instructor and department chair on required form in advance of semester of enrollment. Supervised experience with a cooperating artist or studio. Offered on a satisfactory-fail basis only.

**ARTIS 499: BFA Exhibition**

(1-0) Cr. 1. S.

*Prereq: ARTIS 399; Senior classification in the ISA BFA Curriculum*

Capstone experience for the BFA degree, including the refinement of a final portfolio (visual and written components). Guest lecturers cover range of topics relevant to the professional practice of art and design. Course culminates in the planning, design and installation of the BFA group exhibition in a formal gallery setting. Half-semester course. Required of all ISA majors.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ARTIS 505: Collage, Assemblage, and the Found Object**

(Dual-listed with ARTIS 305). (0-6) Cr. 3. Repeatable.

*Prereq: 6 credits of 200 level studio or permission of instructor*

Explores the significance of recycling, sustainable methods of art making, and thrift-store culture as medium and subject matter for artists in both 2D and 3D studio projects. Through selected readings, slide presentations, and studio activities, we will address the environmental cause and effect of materials and methods, consumption and waste, and personal responsibility as stewards for the planet we share. Emphasis will be on conceptual development.



**ARTIS 507: Principles of Character Animation**

(Dual-listed with ARTIS 407). (0-6) Cr. 3. Repeatable, maximum of 9 credits.

Animation techniques using the computer and available software. Principles of character animation. Prior knowledge of modeling, lighting, texturing and rendering with available software is assumed.

**ARTIS 508: Computer Aided Animation and Visualization**

(0-6) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ARTIS 408 or graduate classification and permission of instructor*  
Further investigations begun in ARTIS 408. Attention given to the workflow and management of creating animation and visualizations.

**ARTIS 509: Computer/Video Game Design and Development**

(Dual-listed with ARTIS 409). (0-6) Cr. 3. Repeatable, maximum of 12 credits.

*Prereq: Permission of instructor. Programming emphasis: COM S 227, COM S 228, COM S 229 or equivalent in engineering; art or graphics emphasis: ARTIS 230 and ARTIS 308; writing emphasis: an English course in creative writing or writing screen plays; business or marketing students: Junior classification*  
Independent project based creation and development of "frivolous and non-frivolous" computer games in a cross-disciplinary team. Projects require cross-disciplinary teams. Aspects of Indie development and computer/video game history will be discussed.

**ARTIS 511: Seminar in Teaching**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Readings and discussions about aspects and expectations of teaching at the university level. Course development, research and teaching portfolio development, and best practices in design education. Other aspects of faculty expectations that include research, institutional or professional service, promotion, institutional structures, procedures, and professional responsibilities.

**ARTIS 520: Advanced Furniture Design**

(Dual-listed with ARTIS 420). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 320*

Design and creation of increasingly complex furniture forms with consideration of precedents and innovative techniques and approaches. Continued development of a unique personal approach to the design and making of furniture. Refined sensitivity to wood, and continued consideration of various sustainable practices.

**ARTIS 522: Advanced Ceramic Studio**

(Dual-listed with ARTIS 422). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: For ARTIS 422: ARTIS 322. For ARTIS 522: graduate classification in the MFA program in Integrated Visual Arts; or permission of instructor*  
Creation of a body of work in personal ceramic forms and unique surface treatments. Exploration of kiln firings, research into contemporary ceramic artists and development of a body of increasingly skilled work are emphasized. Students are expected to be capable of independent studio work and take responsibility for firings.

**ARTIS 524: Jewelry/Metalsmithing III**

(Dual-listed with ARTIS 424). (0-6) Cr. 3. Repeatable, maximum of 12 credits. F.S.

*Prereq: ARTIS 324 or Permission of Instructor*

Hands-on studio experience. Focusing on traditional and contemporary metalsmithing techniques applicable to jewelry, functional objects, and sculptural art forms. Topics include fabrication, forming and cold joinery, with an emphasis on design and progressive skill development. Basic stone setting and lost wax casting introduced.

**ARTIS 529: Advanced Photography**

(Dual-listed with ARTIS 429). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: ARTIS 329*

Independent, advanced work in traditional alternative and/or digital photographic processes. Emphasis is on development of a unified body of work and research into contemporary photographers and aesthetic concern.

**ARTIS 530: Drawing IV**

(Dual-listed with ARTIS 430). (0-6) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 330*

Figurative and/or non-figurative drawing with advanced work in media, composition, and theory.

**ARTIS 531: Character and Scene Design**

(Dual-listed with ARTIS 431). Cr. 3. F.

*Prereq: For ARTIS 431: DSN S 131, plus ARTIS 230, ARTIS 330, or instructor permission after portfolio review. For ARTIS 531: Graduate classification in the MFA program in Integrated Visual Arts; or instructor permission after portfolio review.*

Drawing directed toward designing characters and environments to be used for telling stories in a variety of contexts. Emphasis on ideation, research, concept art and other process work over finished art.

**ARTIS 532: Sequential Narrative Drawing**

(Dual-listed with ARTIS 432). (0-6) Cr. 3. S.

*Prereq: For ARTIS 432: DSN S 131, plus ARTIS 230, ARTIS 330, or instructor permission after portfolio review. For ARTIS 532, Graduate classification in the MFA program in Integrated Visual Arts; or instructor permission after portfolio review.*

Studio course in drawing focusing on the fundamentals of communicating a narrative through sequential images in a variety of applications. Emphasis will be placed on visual research, ideation, concept art and process sketching.

**ARTIS 538: Painting III**

(Dual-listed with ARTIS 438). (0-6) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: ARTIS 338*

Figurative and non-figurative painting with advanced work in media, composition, and theory.

**ARTIS 547: Dyed and Printed Textiles**

(Dual-listed with ARTIS 447). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: For ARTIS 447: ARTIS 347 or permission of instructor; For ARTIS 547: Graduate classification.*

Fabric dyeing and printing techniques including block, stencil and experimental screen-printing, and resists using synthetic dyes, discharging agents, and pigments. Printing with plant-based dyes may also be explored. Digital printing and transfer printing on fabric may be introduced. Emphasis on research and development of dyed and printed textile design techniques as a means for creative expression.

**ARTIS 548: Digital Textile Design**

(Dual-listed with ARTIS 448). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: Junior classification in either College of Design or Apparel, Merchandising, Design*

This hands-on studio course will allow students to explore digital printing technology and its application to textile design for those working within industry as well as independent studio practitioners. Digital design development includes pattern repeats and photo manipulation to create unique textile designs for fashion, interior and fine art applications.

**ARTIS 556: Relief Printmaking: Digital/Traditional**

(Dual-listed with ARTIS 356). (0-6) Cr. 3-4. Repeatable, maximum of 6 credits. F.S.

*Prereq: For ARTIS 356: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 556: Graduate classification or instructor permission*

In-depth exploration of digital or traditional design and block cutting processes (computer/laser cutter/CNC router or drawing/chisels). Use relief printmaking to create a unified body of prints from those blocks. Emphasis is on experimental and creative use of printmaking with study of contemporary trends.

**ARTIS 557: Intaglio and Monotype Printmaking: Digital / Traditional**

(Dual-listed with ARTIS 357). (0-6) Cr. 3-4. Repeatable, maximum of 9 credits. F.S.

*Prereq: For ARTIS 357: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 557: Graduate classification or instructor permission*

Explore the techniques and aesthetic qualities of black and white and color intaglio printmaking primarily through etching, aquatint, laser-cut plates and collagraph processes. Students will generate imagery through traditional drawing, collage and digital processes. Unique, one-of-a-kind black and white and color prints from Plexiglas will also be introduced. Emphasis is on experimental and creative use of printmaking for artistic expression.

**ARTIS 558: Lithography: Digital / Traditional**

(Dual-listed with ARTIS 358). (0-6) Cr. 3. Repeatable. F.S.

*Prereq: For ARTIS 358: ARTIS 206 and credit or enrollment in ARTIS 230, or instructor permission; For ARTIS 558: Graduate classification or instructor permission*

Examine the techniques and aesthetic qualities of lithography primarily through hand-drawn and photographic plates. Students may generate imagery through traditional drawing, collage or digital processes. Emphasis is on experimental and creative use of printmaking for artistic expression. For those taking the course for a second semester, focus is on stone lithography and increased work with color.

**ARTIS 571A: Graduate Seminar: Grants, Residencies, Exhibitions, Entrepreneurialism**

(3-0) Cr. 3.

*Prereq: Admission into graduate program in the College of Design*

Through directed readings, individual assignments, guest presentations, local field trips, and group discussions, students learn strategies to create and apply a personalized plan that will guide them toward successful studio practice at all stages of their careers. Topics include professional opportunities and avenues of support available to studio artists, development in preparing visual portfolios, artists statements, and applications for grants, residencies and exhibitions.

**ARTIS 571B: Graduate Seminar: Critique and Creative Process**

(3-0) Cr. 3.

*Prereq: Admission into graduate program in the College of Design*

Ongoing weekly critiques and dialog about sources, methods, and progress of studio projects. Graduate students will learn to articulate their ideas from concept to creation. The interaction of students at different levels in a broad spectrum of studio courses will reveal commonalities and connections among all of the visual arts, accelerating individual creative development.

**ARTIS 573: Video Art**

(Dual-listed with ARTIS 473). (0-6) Cr. 3.

*Prereq: ARTIS 212 or permission of instructor for enrollment in ARTIS 473; graduate standing or permission of instructor for enrollment in ARTIS 573*

Usage of professional video editing software and application of best practices for video production and post-production to realize original artworks. Creation of narrative and non-narrative videos and site specific video installations. Prominent examples in the history of video art provide context for the coursework. Non-repeatable for graduate students.

**ARTIS 575: Interactive Art**

(Dual-listed with ARTIS 475). (0-6) Cr. 3.

*Prereq: For ARTIS 475: ARTIS 212 or Permission of Instructor; for ARTIS 575: Graduate standing or permission of instructor.*

Create software and integrate the sensors required to create interactive artworks, video games, and installations. Prominent examples in the history of interactive art provide context for the coursework.

**ARTIS 582: Selected Topics in Studio Art**

(Dual-listed with ARTIS 482). Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of Instructor*

Special issues related to studio art. Topics vary each time offered.

**ARTIS 590: Special Topics**

Cr. arr. F.S.SS.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590B: Special Topics: Ceramics**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590C: Special Topics: Computer Art and Design**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590D: Special Topics: Drawing**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590E: Special Topics: Textiles**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590F: Special Topics: Illustration**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590G: Special Topics: Metals**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590I: Special Topics: Painting**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590J: Special Topics: Photography**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590K: Special Topics: Printmaking**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590L: Special Topics: Furniture**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 590M: Special Topics: Mixed Media**

Cr. arr.

*Prereq: Bachelor degree in art and/or design, or evidence of satisfactory equivalency in specialized area*

Written approval of instructor and department chair on required form in advance of semester of enrollment.

**ARTIS 593: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593B: Workshop: Ceramics**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593C: Workshop: Computer Art and Design**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593D: Workshop: Drawing**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593E: Workshop: Textiles**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593F: Workshop: Illustration**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593G: Workshop: Metals**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593I: Workshop: Painting**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593J: Workshop: Photography**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593K: Workshop: Printmaking**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593L: Workshop: Furniture**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 593M: Workshop: Mixed Media**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

Intensive 2 to 4 week studio exploration. Topics vary each time offered and may have prerequisites.

**ARTIS 595: Integrated Studio Arts in Europe**

(Dual-listed with ARTIS 495). Cr. 3.

*Prereq: Graduate classification, ARTIS 494 or equivalent, permission of instructor*

International study abroad program in western Europe. Visits to design studios, art museums, and educational facilities. Related activities depending on specific area of study which may vary each time offered. Meets International Perspectives Requirement.

**Courses for graduate students:****ARTIS 605: Research Methods**

(3-0) Cr. 3.

*Prereq: Permission of instructor*

Research strategies related to fine art and technology. Application of selected methods to specific issues.

### **ARTIS 607: Intermedia**

(0-6) Cr. 3. F.S.

*Prereq: Graduate classification and permission of instructor.*

Exploration and application of media with various materials, methods and ideas.

### **ARTIS 697: Studio Internship**

Cr. arr.

*Prereq: Graduate classification and approval of POS committee*

Supervised off-campus learning experience with a prominent artist, designer, or firm.

### **ARTIS 698: Current Issues in Studio Arts**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.

*Prereq: Graduate classification and permission of instructor.*

Selected issues in contemporary studio arts. Topics and readings vary each time offered.

### **ARTIS 699: Research**

Cr. arr. Repeatable.

Research in Integrated Studio Arts.

### **ARTIS 699A: Research: Thesis**

Cr. arr. Repeatable.

Research thesis.

### **ARTIS 699B: Research: Thesis-exhibition**

Cr. arr. Repeatable.

Research exhibition.

## **Interdisciplinary Graduate Studies (IGS)**

*Any experimental courses offered by IGS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

### **IGS 520: Orientation in Community Development**

(1-0) Cr. 1.

Introduction to the Community Development program. Focus on on-line delivery methods, graduate level research and writing, technology skills.

### **IGS 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

### **IGS 699: Thesis Research**

Cr. arr. Repeatable.

## **Interior Design (ARTID)**

*Any experimental courses offered by ARTID can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

### **ARTID 250: Fundamentals of Interior Design**

(2-0) Cr. 2. F.

The profession, issues, and the role of interior design.

### **ARTID 251: Human Factors in Interior Design**

(3-0) Cr. 3. S.

Overview of issues related to the human/built environment interface: introduction to health and safety factors, ergonomics, anthropometrics, sensory perception, psycho-behavioral response, physical performance, cultural factors and universal design. Emphasis on application of human factor methods to the analysis, solution, and evaluation of design problems.

### **ARTID 255: Forces That Shape Interior Space**

(3-0) Cr. 3. F.S.

A survey of variables influencing the nature and function of "interior" environments. Review of professional, geo-political, utilitarian, social-cultural, economic, humanistic, historical, technological, and other factors as generators of form and space.

### **ARTID 261: Graphic Communication for Interior Design I**

(2-2) Cr. 3. F.

*Prereq: Admission to the Interior Design BFA; ARTID 265*

Perspective drawing, design sketching, and presentation drawings. Introduction to technical drawing conventions, and design drawings. Emphasis on drawing layout, line quality, and lettering. Use of various rendering media and techniques on 2D and 3D drawings. Overview of presentation techniques, both visual and verbal.

### **ARTID 263: Graphic Communication for Interior Design II**

(2-2) Cr. 3. S.

*Prereq: ARTID 261; concurrent enrollment in ARTID 267*

Computer visualization techniques and applications; projects employing computer graphic methods.

### **ARTID 265: Interior Design Studio I**

(1-6) Cr. 4. F.

*Prereq: Admission to the Interior Design BFA; ARTID 250; ARTID 261*

Enhanced creative interior design problem solving. Emphasis on research, spatial composition theories and graphic ideation and communication as applied to the interior design of small scale environments. Modeling and manual visualization techniques.

**ARTID 267: Interior Design Studio II**

(1-6) Cr. 4. S.

*Prereq: ARTID 265*

Human factors issues including ergonomics, human behavior and the requirements of special groups. Color theories related to interior spaces. Residential interior design and medium scale projects. Detail drawings, and expansion of visualization techniques.

**ARTID 350: Interior Finish Materials**

(3-0) Cr. 3. S.

*Prereq: Admission to a College of Design program*

Exploration of concepts, materials, and assemblies associated with development of interior elements including floors, walls, ceiling, windows, and finishes. Fiber, plastic, sheet metal, and other surfacing materials. Attention to related human factors, testing, detailing, specifications writing and end-use application. To take this course, students must have drafting skills to complete scaled orthographic drawings.

**ARTID 351: Interior Regulations and Guidelines**

(3-0) Cr. 3. F.

*Prereq: ARTID 267 OR Permission of Instructor*

Exploration of interior design concepts, materials, and assemblies as they contribute to the user, health, safety and general well-being. Wood, steel, masonry, and glass assemblies. Attention to related human factors, testing, codes, detailing, specifications writing and end-use application.

**ARTID 352: Interior Building Systems**

(3-0) Cr. 3. S.

Exploration of concepts, materials, assemblies associated with building service systems. Overview of electrical, lighting, acoustical, HVAC, plumbing and other non-structural building features. Attention to related human factors, testing, codes, detailing, specifications writing and end-use application.

**ARTID 353: Interior Construction and Details**

(3-0) Cr. 3. F.

Exploration of building construction concepts, materials, and assemblies and their influence on interior design. Attention to human factors, codes, detailing, and other interior design issues related to buildings.

**ARTID 355: Interior Design History/Theory/Criticism I**

(3-0) Cr. 3. F.

Theoretical approaches to evaluation of interior finishes, furnishings, and decorative arts in relation to parallel developments in art and architecture, from a critical, historical and multicultural perspective. Focus on pre-1850.

Meets International Perspectives Requirement.

**ARTID 356: Interior Design History/Theory/Criticism II**

(3-0) Cr. 3. S.

*Prereq: ARTID 355 OR Permission of Instructor*

Advanced theoretical approaches to evaluation of interior finishes, furnishings, and decorative arts in relation to parallel developments in art and architecture from a critical, historical, and multicultural perspective. Focus on mid-nineteenth and twentieth century. Meets International Perspectives Requirement.

**ARTID 357: Made in Italy**

(2-0) Cr. 2. F.

*Prereq: Participation in Study Abroad Rome program*

An investigation of the 20th century roots of modern Italian design and its contemporary form. Lectures and seminar presentations highlight major Italian designers and internationally significant design in the 20th century. Focus is on innovative design that exhibits a synthesis of formal and social functions.

Meets International Perspectives Requirement.

**ARTID 360: Interior Design Internship Seminar I**

(1-0) Cr. 1. F.

*Prereq: ARTID 267*

Procedural and ethical concerns relating to interior design internship. Preparation of documents for internship search. Formulation of personal internship and career goals.

**ARTID 361: Interior Design Internship Seminar II**

(1-0) Cr. 1. S.

*Prereq: ARTID 360*

Procedural and ethical concerns relating to interior design internship. Refinement of placement credentials and personal goals. Internship search process and agreements.

**ARTID 365: Interior Design Studio III**

(1-6) Cr. 4. F.

*Prereq: ARTID 263; ARTID 267*

Refined methods of problem identification design programming and problem solving, including theoretically-based concept development and refinement. Emphasis and compliance with codes and standards. Produce small and large scale projects. Alternative manual and computer-based visualization methods. Teamwork. Multi-cultural, study abroad option.

**ARTID 367: Interior Design Studio IV**

(1-6) Cr. 4-5. S.

*Prereq: ARTID 365*

Emphasis on three-dimensional spatial development in large scale, multiple scale unit institutional projects. Inclusion of extensive design documentation. Expansion of alternative manual and computer-based visualization methods. Teamwork.



**ARTID 367H: Interior Design Studio IV: Honors**

(1-6) Cr. 4-5. S.

*Prereq: ARTID 365*

Emphasis on three-dimensional spatial development in large scale, multiple scale unit institutional projects. Inclusion of extensive design documentation. Expansion of alternative manual and computer-based visualization methods. Teamwork.

**ARTID 460: Interior Design Internship Documentation**

(1-0) Cr. 1. F.

*Prereq: ARTID 350; ARTID 360; ARTID 365*

Documentation of professional interior design off-campus experience.

**ARTID 461: Interior Design Professional Practices**

(2-0) Cr. 2. S.

*Prereq: ARTID 460*

Organization and general management of the interior design office: agreements, business procedures, and professional ethics. Professional interior design issues and concerns.

**ARTID 461H: Interior Design Professional Practices: Honors**

(2-0) Cr. 2. S.

*Prereq: ARTID 460*

Organization and general management of the interior design office: agreements, business procedures, and professional ethics. Professional interior design issues and concerns.

**ARTID 465: Interior Design Studio V**

(Dual-listed with ARTID 565). (1-6) Cr. 4. F.

*Prereq: ARTID 460 OR Permission of Instructor*

Design research and refined problem solving methods including functional analysis, programming and detailing.

**ARTID 467: Interior Design Studio VI**

(Dual-listed with ARTID 567). (1-6) Cr. 4. S.

*Prereq: ARTID 465*

Refinement of technical, analytical and theoretical problem-solving methods and comprehensive design documentation. In-depth development of interior design projects. Current issues in interior design.

**ARTID 468: Interior Design in an Urban Setting**

(1-4) Cr. 3. S.

*Prereq: ARTID 365*

Study of selected interior design projects and designers practicing in an urban setting. Studio project examining issues related to interior design in an urban context.

**ARTID 468H: Interior Design in an Urban Setting: Honors**

(1-4) Cr. 3-4. S.

*Prereq: ARTID 365*

Study of selected interior design projects and designers practicing in an urban setting. Studio project examining issues related to interior design in an urban context.

**ARTID 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Permission of Department*

Student must have completed related interior design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTID 490H: Independent Study, Honors**

Cr. 1-6. Repeatable.

*Prereq: Permission of Department*

Student must have completed related interior design coursework appropriate to planned independent study. Offered on a graded basis or a satisfactory-fail basis.

**ARTID 493: Workshop**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: ARTID 367*

Intensive 2 to 4 week studio exploration. Topics vary each time offered.

**Courses primarily for graduate students, open to qualified undergraduates:**

**ARTID 551: Design Humanics**

(3-0) Cr. 3. Repeatable, maximum of 15 credits. F.S.

*Prereq: Instructor permission*

An exploration of human nature as broadly defined and as applied to design of the built environment. Consideration of human characteristics, responses and performance, at varying scales, as sources of design insight. Topics vary each time offered.

**ARTID 551A: Design Humanics: Sensory Perception & Ergonomic Factors**

(3-0) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: Instructor permission*

Human factors related to the nature, performance and accommodation of the individuals and small groups, including sensation and perception, physical requirements, anthropometrics, safety and other issues connecting human needs and built environmental responses. Topics vary each time offered.

**ARTID 551B: Design Humanics: Environment & Behavior**

(3-0) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: Instructor permission*

Human factors issues related to the nature, performance and accommodation of medium to large groups and settings. Emphasis on psychological, sociological, cultural, interpersonal safety, and related human needs and built environmental responses. Topics vary each time offered.

**ARTID 552: Evidence-Based Design**

(3-0) Cr. 3. Repeatable, maximum of 9 credits. F.S.

*Prereq: Permission of instructor*

Survey of methodologies and methodological tools for varied end uses and drawn from wide ranging sources. Emphasis on their organization and application to design of the human environment. Topics vary each time offered.

**ARTID 552A: Evidence-Based Design: Investigation Analysis**

(3-0) Cr. 3. Repeatable, maximum of 10 credits. F.S.

*Prereq: Permission of instructor*

Methods of design research, analysis, programming and theory formulation.

**ARTID 552B: Evidence-Based Design: Synthesis**

(3-0) Cr. 3. Repeatable, maximum of 10 credits. F.S.

*Prereq: Permission of instructor*

Methods of synthesizing design concepts and solutions.

**ARTID 552C: Evidence-Based Design: Communication**

(3-0) Cr. 3. Repeatable, maximum of 10 credits. F.S.

*Prereq: Permission of instructor*

Methods of managing, translating, communicating and otherwise utilizing text, image, abstract and other forms of information.

**ARTID 552D: Evidence-Based Design: Procedural Alternatives**

(3-0) Cr. 3. Repeatable, maximum of 10 credits. F.S.

*Prereq: Permission of instructor*

New and specialized methodological trends, including subject or setting-specific methods.

**ARTID 554: Interior Design Teaching Practicum**

Cr. 3. Repeatable. F.S.SS.

*Prereq: ARTID 668 and permission of instructor*

Supervised practical application of interior design theory, materials, and practice to the educational process.

**ARTID 559: Graduate Interior Design Field Study**

Cr. 1-3. Repeatable.

*Prereq: Graduate enrollment or permission of instructor*

Study and tours of places of interior design-related interest such as manufacturers, design studios, related professional offices, showrooms, museums, and historical sites.

**ARTID 560: Interior Design Internship**

Cr. 3. F.S.SS.

*Prereq: Permission of instructor.*

Professional interior design off-campus experience.

**ARTID 565: Interior Design Studio V**

(Dual-listed with ARTID 465). (1-6) Cr. 4. F.

*Prereq: ARTID 460 OR Permission of Instructor*

Design research and refined problem solving methods including functional analysis, programming and detailing.

**ARTID 567: Interior Design Studio VI**

(Dual-listed with ARTID 467). (1-6) Cr. 4. S.

*Prereq: ARTID 465*

Refinement of technical, analytical and theoretical problem-solving methods and comprehensive design documentation. In-depth development of interior design projects. Current issues in interior design.

**ARTID 568: Experimental Interior Design**

(0-8) Cr. 4. Repeatable, maximum of 16 credits. F.S.

*Prereq: Graduate classification and permission of instructor*

Application of alternative design methods and sources of insight to the solution of human environmental design problems. Focus on the identification, formulation, refinement and application of theory to the design process. Emphasis on the pursuit of new discovery and innovative problem solving. Approaches, settings and scales vary each time offered.

**ARTID 569: Advanced Studies in Interior Design: Variable Topics**

Cr. 3.

*Prereq: Graduate classification or permission of instructor.*

Examination of special issues with emphasis on their translation into design application.

**ARTID 571: Advanced Visualization in Interior Design**

Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Exploration of an advanced level of computer visualization techniques and applications with relevance to interior design. Introduction to the latest graphic communication software and technologies focuses on data visualization, hybrid digital perspective, 3D modeling & photo-realistic rendering, real-time video making, and Virtual Reality.

**ARTID 572: Preservation & Cultural Heritage**

Cr. 3.

*Prereq: Graduate classification or permission of instructor.*

Examination of special issues with emphasis on their translation into design application.

**ARTID 573: Advanced Color Theory**

Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Examination of special issues with emphasis on their translation into design application.

**ARTID 574: Inclusive Environments**

Cr. 3.

*Prereq: Graduate classification or permission of instructor.*

Examination of special issues with emphasis on their translation into design application.

**ARTID 590: Special Topics**

Cr. arr.

*Prereq: Bachelor's degree in interior design, or evidence of satisfactory equivalency in specialized area. Written approval of instructor and department chair on required form in advance of semester of enrollment*

**ARTID 593: Workshop**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification; evidence of satisfactory experience in area of specialization*

Intensive 2 to 4 week studio exploration. Topics vary each time offered.

**ARTID 598: Research Forum**

(1-0) Cr. 1-3. Repeatable, maximum of 9 times. F.S.

*Prereq: Concurrent enrollment in ARTID 565, ARTID 567, ARTID 568, ARTID 665, or ARTID 668, and permission of instructor*

Presentation and discussion of cross-disciplinary design research theory, methods, and application. Focus on the investigation, application, and communication of types of design research.

**ARTID 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**ARTID 660: Research Methods**

(3-0) Cr. 3. S.

*Prereq: Permission of instructor*

Research strategies related to design. Application of selected methods to specific issues. Open to non-majors.

**ARTID 668: Advanced Experimental Interior Design**

(0-8) Cr. 4. Repeatable, maximum of 16 credits. F.S.

*Prereq: Graduate classification and permission of instructor.*

Application of alternative design methods and sources of insight to the solution of human environmental design problems. Focus on the identification, formulation, refinement and application of theory to the design process. Emphasis on the pursuit of new discovery and innovative problem solving. Approaches, settings and scales vary each time offered.

**ARTID 690: Advanced Topics**

Cr. arr. Repeatable.

*Prereq: M.F.A classification, permission of instructor*

**ARTID 697: Design Practicum**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Approval of POS committee*

Applied, off campus, professional interior design-related experience.

**ARTID 699: Research**

Cr. arr. Repeatable.

**ARTID 699A: Thesis**

Cr. arr. Repeatable.

**ARTID 699B: Thesis-Exhibition**

Cr. arr. Repeatable.

**ARTID A560: Interior Design Internship**

Cr. 3. F.S.SS.

*Prereq: Permission of instructor.*

Professional interior design off-campus experience.

## International Studies (INTST)

***Any experimental courses offered by INTST can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**INTST 235: Introduction to International Studies**

(3-0) Cr. 3. F.SS.

Overview of international studies, emphasizing cultural, geographic, economic, and political characteristics of major world areas and nations. Meets International Perspectives Requirement.

**INTST 250: The World's Regions in a Global Context**

(3-0) Cr. 3. F.S.

Comparative study of the world's regions beyond North America (Africa, Asia, Europe, Latin America and the Caribbean, and the Middle East) within the context of globalization and regionalization. Framework for understanding how environmental, demographic, political and socio-cultural relationships in each region are affected by geographic connections. Exploration of how these relationships will shape future regional geographies.

Meets International Perspectives Requirement.

**INTST 295: International Experience Abroad**

Cr. 1-8. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 12 ISU credits*

Supervised instruction in an international setting, augmented by practical living experience.

Meets International Perspectives Requirement.

**INTST 350: Topics in International Studies**

Cr. 2-4.

Exploration of key topics and themes in International Studies. Topics vary each time offered.

Meets International Perspectives Requirement.

**INTST 395: Interdisciplinary Study Abroad**

Cr. 1-4. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 395A: Interdisciplinary Study Abroad: Pre-Departure Seminar**

Cr. 1. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 395B: Interdisciplinary Study Abroad: Humanities**

Cr. 1-4. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 395C: Interdisciplinary Study Abroad: Communications**

Cr. 1-4. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 395D: Interdisciplinary Study Abroad: Mathematics and Natural Science**

Cr. 1-4. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 395E: Interdisciplinary Study Abroad: Social Sciences**

Cr. 1-4. Repeatable.

Multi-faceted exploration of a selected world region directed at developing a comprehensive understanding of a selected culture's role in contemporary society.

**INTST 430: Seminar in International Studies**

(3-0) Cr. 3. S.

*Prereq: INTST 235; Junior classification or higher*

Capstone seminar in international studies focused on economic development, women's issues, war and ethnic conflict, population, the environment, globalization, human rights, international trade and business and other issues. Students develop a project on a subject linked to their area of professional interest or academic specialization.

Meets International Perspectives Requirement.

**INTST 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor; Permission of International Studies Director*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered or to integrate areas of study appropriate to special problems with international foci. No more than 3 credits of IntSt 490 may be used in the International Studies major or minor.

**INTST 491: Experiences Abroad: Learning to Think Globally**

(Cross-listed with WLC). (1-0) Cr. 1. Repeatable, maximum of 2 credits.

*Prereq: Minimum of 3 credits of study abroad and/or internship abroad*

Students returning from study abroad gain perspective on the personal, academic, and professional impact of their time spent abroad through readings and discussions. Students will be expected to make one presentation about the culture they experienced to an audience outside ISU. Offered on a satisfactory-fail basis only.

## Iowa Lakeside Laboratory (IA LL)

**Courses primarily for undergraduates:**

**IA LL 101: Earth, Air, and Sky**

Cr. 1-4. Alt. SS., offered irregularly.

Essentials of earth science, including astronomy, meteorology, geology, and paleontology; includes laboratory and fieldwork.

**IA LL 293: Natural History Workshop**

Cr. 1-2. Repeatable, maximum of 4 times. Alt. SS., offered irregularly.

A specific aspect of the upper Midwest's natural history, or techniques for studying natural history; amphibians and reptiles, birds and birding, nature photography, mushrooms and other fungi, Iowa's trees and forests, fish biology, prairies, common algae, common insects, aquatic plants, life in rivers, life in lakes, mosses and liverworts, natural history of Iowa Great Lakes region, field archaeology, scuba diving, astronomy, nature sketching; five-day, nontechnical introductions.

**IA LL 310: Science Teaching Methods**

Cr. 1-3. Repeatable. Alt. SS., offered irregularly.

Development and implementation of laboratory exercises suitable for inclusion in elementary, middle, high school, and community college biology, geology, and environmental courses; exercises built around common organisms and ecosystems in Iowa; animal biology, plant biology, fungi and lichens, aquatic ecology, prairie ecology, wetland ecology, limnology, animal behavior, insect ecology, biology of invertebrates, noninvasive use of living organisms, Project WET; field trips.

**IA LL 311: Field Mycology**

Cr. 2. Alt. SS., offered irregularly.

Identification and classification of the common fungi; techniques for identification, preservation, and culture practiced with members of the various fungi groups.

**IA LL 312: Ecology**

Cr. 4. Alt. SS., offered irregularly.

An introduction to the principles of ecology at the population, community and ecosystem level. Field studies of local lakes, wetlands and prairies are used to examine factors controlling distributions, interactions, and roles of plants and animals in native ecosystems. Requirements: two semesters of introductory biology.

**IA LL 314: Nature Based, Early Childhood Teaching Methods Using "The Project Approach"**

Cr. 3-4. Repeatable. Alt. SS., offered irregularly.

Examination of the value of young children's direct experiences in nature through inquiry-based learning; "The Project Approach" builds on children's natural curiosity and enables them to interact, question, connect, problem solve, communicate, and reflect; students follow steps for implementing a nature-based project within their own classroom setting as they insure the needs of diverse learners are met for both social and academic learning; designed for early childhood teachers.

**IA LL 315: Soil Formation and Landscape Relationships**

Cr. 2-4. Alt. SS., offered irregularly.

Relationships between soil formation, geomorphology, environment; soil description, classification, geography, mapping, interpretation for land use.

**IA LL 316: Animal Behavior**

Cr. 2. Alt. SS., offered irregularly.

Examination of ecological and evolutionary theories of animal behavior through field studies of animal coloniality, courtship, territoriality, predator defense, habitat selection, foraging, mating systems, and parental care.

Requirements: two biology courses.

**IA LL 317: Glacial Geomorphology**

Cr. 2-4. Alt. SS., offered irregularly.

Field-based introduction to glacial environments and processes including the origin of sediments, landforms, and landscapes produced in glacial and associated environments; aeolian (wind) processes, river and lacustrine systems, and mechanisms and chronologies of climate change.

**IA LL 326: Ornithology**

Cr. 2-4. Alt. SS., offered irregularly.

The biology, ecology, and behavior of birds with emphasis on field studies of local avifauna. Group projects stress techniques of population analysis and methodology for population studies.

**IA LL 334: Topics in Ecology and Sustainability**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Scientific introduction at intermediate level to ecology and evolution of important groups of organisms: algae to vertebrates, different ecological phenomena (e.g., fire and climate change), varying landforms, different ecosystems (e.g., prairies and aquatic systems); emphasis on sustainability with introduction to concepts, issues, and practices; ability to communicate environmental information through a variety of means.

Requirements: one general biology course.

**IA LL 334B: Topics in Ecology and Sustainability: Lichen Diversity**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Scientific introduction at intermediate level to ecology and evolution of important groups of organisms: algae to vertebrates, different ecological phenomena (e.g., fire and climate change), varying landforms, different ecosystems (e.g., prairies and aquatic systems); emphasis on sustainability with introduction to concepts, issues, and practices; ability to communicate environmental information through a variety of means.

Requirements: one general biology course.

**IA LL 334D: Topics in Ecology and Sustainability: Biology Illustration**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Scientific introduction at intermediate level to ecology and evolution of important groups of organisms: algae to vertebrates, different ecological phenomena (e.g., fire and climate change), varying landforms, different ecosystems (e.g., prairies and aquatic systems); emphasis on sustainability with introduction to concepts, issues, and practices; ability to communicate environmental information through a variety of means. Requirements: one general biology course.

**IA LL 334F: Topics in Ecology and Sustainability: Herpetology**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Scientific introduction at intermediate level to ecology and evolution of important groups of organisms: algae to vertebrates, different ecological phenomena (e.g., fire and climate change), varying landforms, different ecosystems (e.g., prairies and aquatic systems); emphasis on sustainability with introduction to concepts, issues, and practices; ability to communicate environmental information through a variety of means. Requirements: one general biology course.

**IA LL 334G: Topics in Ecology and Sustainability: Ichthyology**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Scientific introduction at intermediate level to ecology and evolution of important groups of organisms: algae to vertebrates, different ecological phenomena (e.g., fire and climate change), varying landforms, different ecosystems (e.g., prairies and aquatic systems); emphasis on sustainability with introduction to concepts, issues, and practices; ability to communicate environmental information through a variety of means. Requirements: one general biology course.

**IA LL 334J: Topic in Ecology and Sustainability: Environmental Nonfiction**

Cr. 2. SS.

Learn the ways scientists can better communicate discoveries and ideas. Learn the importance of identifying your audience and how you can adapt your writing based upon your understanding of those varying audiences.

**IA LL 334K: Topics in Ecology and Sustainability: Making Kin With(in) Place: Literature & Multispecies Kinship**

(Dual-listed with IA LL 534K). Cr. 3. SS.

Exploration of what it means to build kin with a place, while in a place—specifically, Lake Okoboji and the grounds of the Lakeside Laboratory. Consideration of the human impact on our planet and the inherent demand issued by climate change to abandon anthropocentrism and fundamentally alter human relationships with our environments, places, and the species therein. After discussing the cultural and human dimensions of climate change, we will consider multispecies kinship systems and how to build meaningful relationships with place.

**IA LL 334M: Topics in Ecology and Sustainability: Introduction to Geographical Information Systems**

Cr. 2. S.

History, purpose, functionality and basic uses of geographical information systems (GIS) as a tool for demonstrating information in relation to locations on the earth and moments in time. While map data may often serve as the basis for using or understanding geographical information, more complex data and systems may be analyzed using GIS tools to grow understanding of geographical phenomena. For the sake of consistency, ArcGIS tools will be used to familiarize students with the basic application and function of GIS technology in relation to data.

**IA LL 341: Environmental Policy**

Cr. 3. Repeatable. Alt. SS., offered irregularly.

Theory and practice of environmental policies, including the study of U.S. federal environmental policies with direct and indirect bearings on water issues; focus on policy history, implementation, and effectiveness; how policies interact with each other, how local stakeholders perceive their pros and cons, and linkages between local implementation efforts and regional and large-scale impacts.

**IA LL 367: Plant Taxonomy**

Cr. 2-4. Alt. SS., offered irregularly.

Principles of classification and evolution of vascular plants; taxonomic tools and collection techniques; use of keys. Field and laboratory studies emphasizing identification of local flowering plants and recognition of major plant families.

**IA LL 408: Aquatic Ecology**

Cr. 2-4. Alt. SS., offered irregularly.

Analysis of aquatic ecosystems; emphasis on basic ecological principles; ecological theories tested in the field; identification of common plants and animals. Requirements: ecology, chemistry, and physics courses.

**IA LL 412: Restoration Ecology**

Cr. 2. Repeatable. Alt. SS., offered irregularly.

Ecological principles for restoration of native ecosystems; establishment (site preparation, selection of seed mixes, planting techniques) and management (fire, mowing, weed control) of native vegetation; evaluation of restorations; emphasis on prairie restoration and wetland vegetation. Requirements: ecology courses.

**IA LL 422: Prairie Ecology**

Cr. 4. Alt. SS., offered irregularly.

Basic patterns and underlying physical and biotic causes of both regional and local distributions of plants and animals of North American prairies; field and laboratory analyses and projects. Requirements: familiarity with basic principles of biology and ecology.



**IA LL 423: Prairie Ecology I**

Cr. 2. Alt. SS., offered irregularly.

Recognition of Iowa prairie plants and understanding the systems in which they exist; emphasis on identification of tallgrass prairie flora by sight recognition, family, genus, species, and common names.

Requirements: basic familiarity with biology and ecology.

**IA LL 424: Prairie Ecology II**

Cr. 2. Alt. SS., offered irregularly.

Hands-on learning experiences demonstrating dynamic, human-influenced (anthropogenic) systems which have impacted prairie ecosystems for the past 10,000 years or more; emphasis on identification of tallgrass prairie flora by sight recognition, family, genus, species, and common names. Requirements: general familiarity with biology and ecology.

**IA LL 427: Field Archaeology**

Cr. 3-4. Alt. SS., offered irregularly.

Nature of cultural and environmental evidence in archaeology and how they are used to model past human behavior and land use; emphasis on Iowa prehistory; basic reconnaissance surveying and excavation techniques.

**IA LL 436: Illustrating Nature II Photography**

Cr. 1-2. Repeatable. Alt. SS., offered irregularly.

Beginning to intermediate technical and compositional aspects of color photography of natural areas and their plants and animals.

**IA LL 480: Ecology and Systematics of Diatoms**

Cr. 2-4. Alt. SS., offered irregularly.

Field and laboratory study of freshwater diatoms; techniques in collection, preparation, and identification of diatom samples; study of environmental factors affecting growth, distribution, taxonomic characters; project design and execution including construction of reference and voucher collections and data organization and analysis.

**IA LL 482: Ecology and Systematics of Algae**

Cr. 2-4. Alt. SS., offered irregularly.

Ecology, morphological structure, phylogeny, and taxonomy of freshwater algae based on field material collected; emphasis on genus-level identifications, biodiversity, ecology; habitat visits to lakes, fens, streams, rivers; algal ecology.

**IA LL 490: Undergraduate Independent Study**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

Research opportunities for undergraduate students in the biological sciences. Requirements: junior or senior standing.

**IA LL 495: Introduction to Research and Inquiry**

Cr. 1-3. Repeatable. Alt. SS., offered irregularly.

How data transforms to information and ultimately knowledge through scientific investigations; examinations and applications include steps formulating the scientific method using 21st-century data, conditions, and related challenges; deliverables include a thoroughly documented scientific experiment beginning with research questions and hypotheses, recommended methods, and concluding with anticipated results.

**Courses primarily for graduate students, open to qualified undergraduates:**

**IA LL 521: Ecology and Systematics of Diatoms**

Cr. 2-4. Alt. SS., offered irregularly.

**IA LL 534K: Topics in Ecology and Sustainability: Making Kin With(in) Place: Literature & Multispecies Kinship**

(Dual-listed with IA LL 334K). Cr. 3. SS.

Exploration of what it means to build kin with a place, while in a place—specifically, Lake Okoboji and the grounds of the Lakeside Laboratory. Consideration of the human impact on our planet and the inherent demand issued by climate change to abandon anthropocentrism and fundamentally alter human relationships with our environments, places, and the species therein. After discussing the cultural and human dimensions of climate change, we will consider multispecies kinship systems and how to build meaningful relationships with place.

**IA LL 590: Graduate Independent Study**

Cr. 1-4. Repeatable. Alt. SS., offered irregularly.

*Prereq: Graduate classification and permission of instructor*

## Italian (ITAL)

**Courses primarily for undergraduates:**

**ITAL 107: Intensive Beginning Italian**

Cr. 4. F.S.

A communicative approach to grammar and vocabulary within the context of Italian culture for students whose native language is not Italian. Taught in Italian.

## Journalism and Mass Communication (JL MC)

*Any experimental courses offered by JL MC can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**JL MC 101: Mass Media and Society**

(3-0) Cr. 3. F.S.SS.

Communication theory models and their application to the mass media; the mass communication process; organization, characteristics and responsibilities of the mass media; media literacy process.

**JL MC 110: Orientation to Journalism and Communication**

(1-0) Cr. 1. F.S.

Orientation to professional and pre-professional opportunities, writing for the mass media and curriculum requirements in the Greenlee School. Basic media writing preparation. Offered on a satisfactory-fail basis only.

**JL MC 201: Reporting and Writing for the Mass Media**

(2-2) Cr. 3.

*Prereq: Greenlee majors only or departmental permission. Credit or concurrent enrollment in JL MC 110.*

Generating story ideas, exercising news judgment and gathering information via interviews, observation and documentary sources to produce news and informational material for the mass media. Emphasis on analyzing and organizing information, as well as accuracy and principles of good writing. Use of AP Style.

**JL MC 240: Principles of Journalism**

Cr. 3. F.S.

Analysis of journalism industry and specific audiences served by print, electronic, visual and digital media. Introduction to core values of journalism and guiding principles that encompass literacy, ethics, law, history, the economy and cultural and societal implications.

**JL MC 242: Visual Principles for Mass Communicators**

(3-0) Cr. 3. F.S.

Understanding and analysis of the visual message. Visual perception, visual communication theory, design syntax, design elements and how they are applied in mass communication.

**JL MC 260: Media Controversies in Science and Technology**

Cr. 3.

Understanding science communication in the media. Exploring audience perceptions, media portrayals, underlying theories and social controversies related to communication of science and technology.

**JL MC 302: Intermediate Reporting and Writing for the Mass Media**

(2-2) Cr. 3.

*Prereq: JL MC 110; minimum of C+ in JL MC 201*

Researching, organizing and writing for newspapers, magazines and digital media. Enhancing and refining skills in developing sources and generating story ideas. Information-gathering techniques, reporting and writing.

**JL MC 303: Reporting and Writing for Broadcast Media**

(2-2) Cr. 3.

*Prereq: JL MC 110; minimum of C+ in JL MC 201*

Researching, organizing, and writing for radio, television and digital media. Basic principles of news programming and storytelling across broadcast media platforms. An emphasis on development, content and structure.

**JL MC 306: Broadcast Media Production**

(2-1) Cr. 3. F.S.

*Prereq: Minimum of C+ in JL MC 201*

Introduction to studio production using professional equipment. Course focus on visual concepts, maintenance and practical operation of studio equipment.

**JL MC 307: Digital Video Production**

(2-2) Cr. 3.

Creation of video productions for use as communication tools in advertising, promotions, short documentaries and public relations. Technical and artistic fundamentals of video production including planning, scripting, shooting, lighting and digital editing.

**JL MC 308: Broadcast News Gathering and Production**

(2-2) Cr. 3.

*Prereq: Minimum of C+ in JL MC 201.*

Field techniques in single-camera video production used to shoot and edit visual stories. Introduction to broadcast news gathering.

**JL MC 310: Fundamentals of Photojournalism**

(2-2) Cr. 3. F.S.

*Prereq: Minimum of C+ in JL MC 201*

Basic photojournalism techniques. Includes camera operation, lighting, composition and photo reproduction techniques for print or computer-mediated applications. Emphasis on using the camera as a reporting tool. Basic use of digital imaging and editing software. Ethical issues involving photojournalism.

**JL MC 311: Fundamentals of Mobile Photography**

Cr. 3.

Basic photographic techniques for publication. Includes smartphone operation, lighting, composition and historical overview of photography and use in digital platforms. Basic use of image editing software. Ethical issues involving photo publication in media platforms. A smartphone camera is required. Credit in JL MC 311 may not be applied toward requirements for degree by ARTIS majors.

**JL MC 312: Advanced Techniques in Photojournalism**

(2-2) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: JL MC 310 or Permission of Instructor*

Advanced techniques and problem solving, both ethical and technical, for photographers who seek to be members of newsgathering teams. Photographic storytelling using a combination of audio and still photography techniques to report stories for print and web publications. Hands on experience with latest digital imaging technology. A digital SLR camera is required.

**JL MC 315: Digital Storytelling**

(2-2) Cr. 3. F.S.

*Prereq: JL MC 308 or JL MC 310 or JL MC 316*

Identify and critically evaluate multimedia elements in journalistic storytelling. Produce audio, photographic and video story packages for a variety of outlets. Choose and work with appropriate digital tools. Learn economic, social and ethical issues that influence media today. Computer design proficiency recommended.

**JL MC 316: Visual Communication Design**

(2-2) Cr. 3. F.S.

*Prereq: Minimum of C+ in JL MC 201*

Beginning techniques in layout, photo editing, and vector artwork. Application of visual principles and creative problem-solving to digital, social media, and print design projects. Use of industry-standard tools such as Adobe Photoshop, Illustrator, and InDesign.

**JL MC 317: Publishing for Mobile Devices**

(2-2) Cr. 3. S.

*Prereq: JL MC 316*

Creating, designing and publishing content for mobile devices through use of industry-standard tools. Exposure to animation and HTML. Computer design proficiency recommended.

**JL MC 344: Feature Writing**

(2-2) Cr. 3.

*Prereq: Minimum of C+ in JL MC 302, JL MC 303 or P R 321*

Reporting and writing short- and long- form stories for magazines, newspapers, corporate communication and the Web. Focus on departmental stories, personal essays, trend or conflict articles and personality profiles. Emphasis on immersion reporting. Majors may not apply both 344 and Engl 303 toward graduation.

**JL MC 346: Public Affairs Reporting**

(2-2) Cr. 3.

*Prereq: Minimum of C+ in JL MC 302, JL MC 303 or P R 321*

Reporting and writing about government, business, and other institutions; identification of and access to public records; investigative reporting techniques; developing major stories about government and nonprofit organizations; and ethical issues.

**JL MC 347: Science Communication**

(Dual-listed with JL MC 547). (3-0) Cr. 3.

*Prereq: JL MC 347: C+ or better in JL MC 302, JL MC 303 or P R 321.*

*Nonmajors and minors by permission of instructor. JL MC 547: Graduate classification.*

Understanding and practicing science communication. Emphasis on building skills to report on science topics, telling science stories using different kinds of media, and understanding factors that impact how different audiences interpret scientific information. Explorations of science communication products relevant to health, natural resources, social science, and technology.

**JL MC 349: News and Feature Editing**

(2-2) Cr. 3.

*Prereq: Minimum of C+ in JL MC 302, JL MC 303 or P R 321*

Editing content for multiple platforms, including websites, magazines, newspapers, and newsletters. Adapting material for audiences, including selection and organization of text and visuals, grammar, punctuation, usage, logic and accuracy. Designing print and online layouts. Using search engine optimization and social media to promote content.

**JL MC 390: Professional Skills Development**

(Cross-listed with ADVRT, P R). Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Minimum of C+ in JL MC 201; other vary by topic. Instructor permission for non-majors.*

Check with Greenlee School for course availability.

**JL MC 391: Short Course Intensive**

(Cross-listed with ADVRT, P R). Cr. 1-3. Repeatable, maximum of 6 credits.

Focused short courses on timely concepts. Check with Greenlee School for course availability. Offered on a satisfactory-fail basis only.

**JL MC 401: Mass Communication Theory**

(3-0) Cr. 3.

*Prereq: Junior classification*

Theory and research in mass communication processes and effects; the scientific process; methods of measuring, evaluating and reporting mass communication research.

**JL MC 406: Media Management**

(Dual-listed with JL MC 506). (3-0) Cr. 3.

*Prereq: JL MC 406: Junior classification. JL MC 506: Graduate classification or Permission of Instructor*

Decision-making functions of media. Basic media market analysis, media organization and management, circulation and audience development, technological developments affecting management decisions, and relationships with labor and regulatory agencies that affect media operations.

**JL MC 460: Law of Mass Communication**

(3-0) Cr. 3.

*Prereq:* JL MC 110 and minimum of C+ in JL MC 201; junior classification.  
*Nonmajors by permission of department.*

First Amendment law, libel, privacy, obscenity, contempt, copyright, trademark, the Federal Communications Act; laws affecting advertising, legal publication, and other business activities of the media.

**JL MC 461: History of American Journalism**

(3-0) Cr. 3.

*Prereq:* Junior classification

Role of the mass media, including advertising and public relations, in shaping the social, economic and political history of America; impact of change in these areas on the development, traditions and philosophies of the media.

**JL MC 462: Media Ethics, Freedom, Responsibility**

(3-0) Cr. 3.

*Prereq:* JL MC 110 and minimum of C+ in JL MC 201. *Greenlee majors only.*  
Ethics and professionalism in the practice of journalism, public relations and advertising.

**JL MC 464: Journalism and Literature**

(3-0) Cr. 3.

*Prereq:* Junior classification

A study of journalism's impact on literary writing and literature's impact on journalism, as seen through the works of esteemed American author-journalists.

**JL MC 473: Social Media Strategy**

(Cross-listed with ADVRT, P R). (3-0) Cr. 3. F.S.

*Prereq:* Junior classification

The strategic use of social media, from both an advertising and public relationship standpoint, to the advantage of a client or organization. Examination and analysis of the social media space from a business perspective. Best practices in the areas of strategic planning, tactical execution, and measurement of social media platforms.

**JL MC 474: Communication Technology and Social Change**

(3-0) Cr. 3.

*Prereq:* Junior classification

Examination of historical and current communication technologies, including how they shape and are shaped by the cultural and social practices into which they are introduced.

Meets International Perspectives Requirement.

**JL MC 476: World Communication Systems**

(Dual-listed with JL MC 576). (3-0) Cr. 3.

*Prereq:* JL MC 476: Junior Classification. JL MC 576: Graduate classification or instructor permission.

World communication systems and social, political, and economic factors determining flow, character, and volume of news. Impact of media information, advertising and public relations on nations and societies. Comparative analysis of role and impact of traditional modes of communication, the mass media and computer-mediated systems. Meets International Perspectives Requirement.

**JL MC 477: Diversity in the Media**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Junior classification

Portrayals of ethnic groups, gender, sexual orientation and social class in the media in news, advertising, information and entertainment; the effects of mass media on social issues and population groups.

**JL MC 490: Independent Study in Communication**

Cr. arr.

*Prereq:* Junior classification; Permission of Instructor

Projects during which students may study problems associated with a medium, a professional specialization, a philosophical or practical concern, a reportorial method or writing technique, or a special topic in their field. Credit is not given for working on student or professional media without an accompanying research component. No more than 3 credits of ADVRT/JLMC/PR 490 may be used toward a degree in the Greenlee School.

**JL MC 497: Special Topics in Communication**

(Cross-listed with ADVRT, P R). Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq:* Junior classification

Seminars or one-time classes on topics of relevance to students in communication. See Schedule of Classes for topics.

**JL MC 499: Professional Media Internship**

Cr. 1-3. F.S.SS.

*Prereq:* ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110, ADVRT 301 or P R 301; minimum of C + in P R 321]); Advisor Approval

See ADVRT/JL MC/P R 499A or 499B. Offered on a satisfactory-fail basis only.

**JL MC 499A: Professional Media Internship: Required**

Cr. 3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110, ADVRT 301 or P R 301; minimum of C + in P R 321]); Advisor Approval*

Initial, required internship. A 400-hour (for 3 credits) internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

**JL MC 499B: Professional Media Internship: Optional**

Cr. 1-3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110, ADVRT 301 or P R 301; minimum of C + in P R 321]); Advisor Approval*

Optional internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**JL MC 501: Theories of Mass Communication**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Historical overview of mass communication theories. Examination of major areas of research activity and theoretical development related to organization, functions, and effects of mass communication.

**JL MC 502: Fundamentals of Communication Research Methods**

(3-0) Cr. 3.

*Prereq: JL MC 501 or concurrent enrollment.*

Research methods in journalism and mass communication, including problem selection, sampling, hypothesis formulation, research design, data collection and analysis. Designing a research strategy appropriate for a variety of communication-related questions and assessing the appropriateness, validity, and generalizability of research results.

**JL MC 506: Media Management**

(Dual-listed with JL MC 406). (3-0) Cr. 3.

*Prereq: JL MC 406: Junior classification. JL MC 506: Graduate classification or Permission of Instructor*

Decision-making functions of media. Basic media market analysis, media organization and management, circulation and audience development, technological developments affecting management decisions, and relationships with labor and regulatory agencies that affect media operations.

**JL MC 510: Strategies of Communication**

(3-0) Cr. 3.

*Prereq: JL MC 501 or instructor permission*

The process of developing professional communication and persuasion strategies, with emphasis on problem definition, behavioral objectives, situation analysis, strategy formulation, and justification through application of communication theories and research.

**JL MC 520: Public Relations Theory and Methods**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Overview of dominant theories and research methods applied to the study and practice of public relations.

**JL MC 521: Theories of Visual Communication**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Explores the theoretical frameworks in visual communication, including concepts of perception, visual language, visual persuasion, and the social, political and cultural implications of the use of images. Understanding the function of images in changing knowledge, attitudes and behavior.

**JL MC 547: Science Communication**

(Dual-listed with JL MC 347). (3-0) Cr. 3.

*Prereq: JL MC 347: C+ or better in JL MC 302, JL MC 303 or P R 321.*

*Nonmajors and minors by permission of instructor. JL MC 547: Graduate classification.*

Understanding and practicing science communication. Emphasis on building skills to report on science topics, telling science stories using different kinds of media, and understanding factors that impact how different audiences interpret scientific information. Explorations of science communication products relevant to health, natural resources, social science, and technology.

**JL MC 560: Risk Perception and Communication**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Study of risk communication principles, models and theories applicable to any risk communication situation. Emphasis on science, technology and risk issues, such as food, health, agriculture and the environment. Examines roles of scientists and communicators in cultivating a public informed about scientific and technological issues.

**JL MC 561: Media and Society: Interrelationships**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Media roles and functions in society including interrelationships between the media and a variety of social actors and forces. Theories and practices regarding social networking and communication via social media; influence of social media and social networking.

**JL MC 574: Communication Technologies and Social Change**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Personal, organizational, and social implications of the use of communication technologies. Includes theories and empirical research across the continuum of perspectives, from techno-utopianism through an anti-technology stance.

Meets International Perspectives Requirement.

**JL MC 576: World Communication Systems**

(Dual-listed with JL MC 476). (3-0) Cr. 3.

*Prereq: JL MC 476: Junior Classification. JL MC 576: Graduate classification or instructor permission.*

World communication systems and social, political, and economic factors determining flow, character, and volume of news. Impact of media information, advertising and public relations on nations and societies. Comparative analysis of role and impact of traditional modes of communication, the mass media and computer-mediated systems.

Meets International Perspectives Requirement.

**JL MC 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 590A: Special Topics: Media Studies**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 590B: Special Topics: Professional Specialization**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 590C: Special Topics: Research Problems and Methods**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 590D: Special Topics: Technique and Style**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 590E: Special Topics: Specialized Communication**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***JL MC 591: Professional Internship**

Cr. 1-2. F.S.SS.

*Prereq: Permission of instructor*

Supervised internship experience. Offered on a satisfactory-fail basis only.

**JL MC 592: Introduction to Graduate Study in Journalism and Mass Communication**

(1-0) Cr. 1.

*Prereq: Graduate classification in JL MC.*

Overview of advanced study in journalism and mass communication with special emphasis on requirements for obtaining the master of science degree.

**JL MC 598: Seminars in Mass Communication**

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: graduate classification or instructor permission.*

Seminar in Mass Communication.

**JL MC 598A: Seminars in Mass Communication: Audiences and Effects**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598B: Seminars in Mass Communication: Communication Technology**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598C: Seminars in Mass Communication: Professional Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598D: Seminars in Mass Communication: Development Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598E: Seminars in Mass Communication: Evaluation Methods**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598F: Seminars in Mass Communication: International Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.***JL MC 598G: Seminars in Mass Communication: Mass Communication History**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*



**JL MC 598H: Seminars in Mass Communication: Mass Communication Law**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598I: Seminars in Mass Communication: Media Management**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598J: Seminars in Mass Communication: Research Methods**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598K: Seminars in Mass Communication: Society and Mass Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598L: Seminars in Mass Communication: Journalism and Mass Communication Education**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598M: Seminars in Mass Communication: Visual Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598N: Seminars in Mass Communication: Broadcast Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598O: Seminars in Mass Communication: Communication Theory**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598P: Seminars in Mass Communication: Computer Mediated Communication**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 598Q: Seminars in Mass Communication: Science, Technology and Risk Communication.**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification or instructor permission.*

**JL MC 599: Creative Component**

Cr. arr. Repeatable.

*Prereq: Approved creative component proposal*

**Courses for graduate students:**

**JL MC 699: Thesis Research**

Cr. arr. Repeatable.

*Prereq: Approved thesis proposal*

## Kinesiology (KIN)

***Any experimental courses offered by KIN can be found at:***

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**KIN 101: Swimming I**

(0-3) Cr. 1. F.S.SS.

Basic course for nonswimmers. Emphasis on two fundamental strokes and personal water safety skills. Offered on a satisfactory-fail basis only.

**KIN 102: Swimming II**

(0-3) Cr. 1. F.S.

*Prereq: KIN 101*

Intermediate course. Emphasis on learning and improving five basic strokes and personal water safety skills. Offered on a satisfactory-fail basis only.

**KIN 108: Aquatic Fitness**

(0-3) Cr. 1. F.S.

*Prereq: KIN 102 or Permission of Instructor*

Water related exercises, activities, and swimming workouts to improve physical fitness. Offered on a satisfactory-fail basis only.

**KIN 122: Badminton**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental badminton skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 129: Bowling**

(0-2) Cr. 1. F.S.SS.

Introduction to bowling skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 135: Golf**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental golf skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 144: Racquetball**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental racquetball skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 153: Ice Skating**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental ice skating skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 158: Tennis**

(0-2) Cr. 1. F.S.SS.

Introduction to basic skills (forehand, backhand, service) and basic knowledge of game play. Offered on a satisfactory-fail basis only.

**KIN 163: Physical Fitness**

(0-3) Cr. 1. F.S.SS.

Evaluation of fitness status. Exercises, activities, and programs to improve physical fitness. Offered on a satisfactory-fail basis only. Credit for only KIN 163 or 258 may be applied toward graduation.

**KIN 164: Walking for Fitness**

(0-3) Cr. 1. F.S.SS.

Fitness walking as an activity to improve health and fitness; values of this type of activity as a lifetime endeavor with knowledge and usage of pedometers. Offered on a satisfactory-fail basis only.

**KIN 165: Running for Fitness**

(0-2) Cr. 1. F.S.SS.

Running as a physical activity to improve physical fitness and health. Promotion of this activity as a lifetime endeavor. Offered on a satisfactory-fail basis only.

**KIN 166: Weight Training**

(0-3) Cr. 1. F.S.SS.

Introduction to fundamental skills of weight training and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 168: Judo**

(0-2) Cr. 1. F.S.

Fundamentals of self defense, focusing on throwing with the hands, hips and feet as well as applying pins, chokes and arm-bars. The physical skills will be taught focused on training through development of courtesy, integrity, perseverance, self control, & indomitable spirit. Emphasis on learning a way of life that promotes personal development, physical health and citizenship. Offered on a satisfactory-fail basis only.

**KIN 170: Tae Kwon Do/Karate I**

(0-2) Cr. 1. F.S.

Teaches fundamentals of self-defense, focusing on hand and foot striking and blocking techniques. The physical skills will be taught focused on training through development of courtesy, integrity, perseverance, self-control and indomitable spirit. It will be emphasized that each student learns a way of life that promotes personal development, physical health and citizenship. Offered on a satisfactory-fail basis only.

**KIN 171: Tae Kwon Do/Karate II**

(0-2) Cr. 1. F.S.

Teaches advanced application of self-defense focusing on hand and foot striking and blocking techniques. The physical skills will be taught focused on training through development of courtesy, integrity, perseverance, self-control and indomitable spirit. It will be emphasized that each student learns a way of life that promotes personal development, physical health and citizenship. Offered on a satisfactory-fail basis only.

**KIN 173: Hap Ki Do/Martial Self-Defense**

(0-2) Cr. 1. F.S.

Teaches fundamentals of self-defense focusing on joint locks, pressure points and throwing techniques to escape from an attacker. The physical skills will be taught focused on training through development of courtesy, integrity, perseverance, self-control and indomitable spirit. It will be emphasized that each student learns a way of life that promotes personal development, physical health & citizenship. Offered on a satisfactory-fail basis only.

**KIN 182: Volleyball**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental volleyball skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 185: Soccer**

(0-2) Cr. 1. F.S.SS.

Introduction to fundamental soccer skills and strategic game play. Offered on a satisfactory-fail basis only.

**KIN 210: Concepts of Fitness and Wellness**

(2-0) Cr. 2. F.S.

Coverage of behavioral skills needed to adopt and maintain lifestyles conducive to fitness and wellness. Provides students with knowledge and skills needed to adopt and maintain healthy lifestyles. Includes self-assessments and content on physical activity, nutrition, weight control, stress management and other lifestyle behaviors related to health. For non-kinesiology majors.

**KIN 231: Fundamentals of Tumbling and Gymnastics**

(0-3) Cr. 1. F.

*Prereq: Physical Education Teacher Education Specialization*

Fundamentals of tumbling and gymnastics apparatus. Skill enhancement, analysis, understanding practice and the development of progressions.

**KIN 232: Fundamentals of Team Sports**

(0-3) Cr. 1. F.

*Prereq: Physical Education Teacher Education Specialization*

Fundamentals of indoor and outdoor team sports, for example basketball, volleyball, flag football, and soccer. Skill enhancement, analysis, understanding practice and the development of progressions.

**KIN 236: Fundamentals of Individual Sports and Fitness**

(0-3) Cr. 1. S.

*Prereq: Physical Education Teacher Education Specialization*

Fundamentals of individual sports and fitness, for example disc golf, bowling, badminton, and weight training. Skill enhancement, analysis, understanding practice and the development of progressions.

**KIN 242: Planning for Success in a Health Career**

Cr. 0.5. F.S.

*Prereq: Pre-Health Professions Specialization; Sophomore classification*

Reflection and discovery to better understand skills needed for admission to professional and graduate school. Facilitate preparation of relevant materials and develop professional school admission strategies. Offered on a satisfactory-fail basis only.

**KIN 252: Introduction to the Discipline of Kinesiology**

(1-0) Cr. 1. F.S.

Relevant societal issues and research within the discipline of Kinesiology (the study of movement) are addressed.

**KIN 253: Orientation and Learning Community in Kinesiology and Health**

(1-0) Cr. 1. F.S.

Overview of ISU policies and procedures, academic advising operations, degree requirements, program of study planning, and campus resources. Students will have out-of-class activities and work with faculty, staff and mentors to explore careers in Kinesiology and complete assignments related to identification & development of their skills and interests. Department of Kinesiology students only. Offered on a satisfactory-fail basis only.

**KIN 258: Principles of Physical Fitness and Conditioning**

(1-3) Cr. 2. F.S.

Introduction to five components of fitness: cardiorespiratory, muscular strength, muscular endurance, flexibility, and body composition. Students will be introduced to basic exercise prescription and evaluation principles, develop skills to assess each component of fitness, and learn different exercise modalities to enhance each component. Credit for only one of the following courses may be applied toward graduation: KIN 163, 258.

**KIN 259: Leadership Techniques for Fitness Programs**

(2-2) Cr. 3. F.S.

*Prereq: KIN 258*

Development of exercise leadership skills for a variety of activities. Includes planning, promotion, and teaching techniques for developing fitness in others using a variety of exercise modalities including group fitness and weight training. Kinesiology and health majors only.

**KIN 266: Advanced Strength Training and Conditioning**

(1-2) Cr. 2. F.S.

*Prereq: KIN 258*

This course is designed to enhance the student's current level of knowledge and expertise to an advanced level in the area of strength training and conditioning. The course will prepare students interested in taking the National Strength and Conditioning Association Certified and Conditioning Specialist's exam. The course will focus on the assessment and implementation of training programs with strong emphasis on the areas of resistance training, metabolic training, flexibility, reaction time, speed, and agility. Kinesiology and health majors only and permission of instructor needed.

**KIN 280: Directed Field Experience in Elementary Physical Education**

(0-3) Cr. 1. F.S.

*Prereq: Physical Education Teacher Education Specialization*

Observing, planning, and facilitating movement experiences of children in an elementary school setting. Offered on a satisfactory-fail basis only.

**KIN 281: Directed Field Experience in Secondary Physical Education**

(0-3) Cr. 1. F.S.

*Prereq: Physical Education Teacher Education Specialization*

Observing, planning, and facilitating movement experiences of students in a middle and/or high school setting. Offered on a satisfactory-fail basis only.

**KIN 282: Field Experience with Educational Outreach**

(0-2) Cr. 1. F.S.

*Prereq: Admission to Educator Preparation Program*

Planning and facilitating physical education experiences for children in a community outreach setting. Experiences take place on campus. Offered on a satisfactory-fail basis only.

**KIN 284: Elementary and Pre-school Movement Education**

(2-3) Cr. 3. F.S.

*Prereq: 3 credits in human development and family studies*

Approaches to teaching movement skills, health-related fitness and school-based physical activities (in the classroom, in PE, during recess) to pre-school and elementary school age children are covered. Emphasis is placed on planning and conducting developmentally appropriate movement experiences for preschool and elementary aged children throughout the school day based upon educational psychology, exercise psychology and motor development research. Practical experience is provided. Credit in only one of the following courses may be applied toward graduation: KIN 284, 312.

**KIN 285: Pre-Internship in Kinesiology and Health**

(Cross-listed with H S). Cr. 1-2. F.S.

*Prereq: Kinesiology and Health major; credit or concurrent enrollment in KIN 258; Permission of Internship Coordinator*

Pre-internship experience with a health organization based on option. Offered on a satisfactory-fail basis only.

**KIN 290: Independent Study**

Cr. 1. Repeatable, maximum of 3 credits. F.S.

*Prereq: 2nd semester Freshmen or Sophomore classification; Permission of Instructor*

Study under supervision of faculty.

**KIN 312: Movement Education in Elementary School Physical Education**

(2-2) Cr. 3. F.

*Prereq: Admission to Education Preparation Program*

Planning for management and instruction of developmentally appropriate physical education for children pre-school through grade six. Laboratory experience required. Credit for only one of KIN 284 or KIN 312 may be applied toward graduation.

**KIN 313: Teaching Secondary Physical Education**

(2-3) Cr. 3. S.

*Prereq: Admission to Education Preparation Program*

Current theory, practice and research on teaching focusing on management, instructional, and learning styles of students in secondary schools.

**KIN 315: Coaching Theory and Administrative Issues**

(3-0) Cr. 3. F.S.SS.

Study in the theory, ethics, strategy, and mechanics of coaching various interscholastic and/or intercollegiate sports. Emphasis on formulating a philosophy, identifying goals and psychological aspects, teaching skills, and developing strategies.

**KIN 345: Management of Health-Fitness Programs and Facilities**

(3-0) Cr. 3. F.S.

Application of management concepts to the fitness industry, e.g., understanding customers, marketing, program management, financial management, legal issues, and evaluation and planning.

**KIN 355: Biomechanics**

(3-0) Cr. 3. F.S.SS.

*Prereq: PHYS 115 or PHYS 131*

Mechanical basis of human performance; application of mechanical principles to exercise, sport and other physical activities.

**KIN 358: Exercise Physiology**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 255; BIOL 256*

Physiological basis of human performance; effects of physical activity on body functions.

**KIN 359: Exercise Physiology Lab**

(0-2) Cr. 1. F.S.SS.

*Prereq: Concurrent enrollment in KIN 358*

Learning lab techniques in Exercise Physiology and engaging in the experimental process.

**KIN 360: Sociology of Physical Activity and Health**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Provide an overview of sociology to enhance students understanding of societal forces influencing behavior; Provide insights about people, environments, organization and policies that impact Kinesiology professionals.

Meets U.S. Diversity Requirement

**KIN 363: Basic Electrocardiography**

(2-0) Cr. 2. Alt. F., offered even-numbered years.

Understanding of human electrocardiography, including normal and abnormal 12-lead ECGs and arrhythmia identification.

**KIN 365: Sport Psychology**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101 or PSYCH 230*

Psychological factors that influence performance in sport settings.

The influence of personality, anxiety, motivation and social factors.

Psychological skills training and strategic methods for improvement of athletic performance.

**KIN 366: Exercise Psychology**

(3-0) Cr. 3. F.S.SS.

*Prereq: PSYCH 101 or PSYCH 230*

Psychological theories for understanding and predicting health-oriented exercise behavior. Psychological and psychobiological responses to exercise. Psychological interventions for increasing exercise participation and adherence rates.

**KIN 372: Motor Control and Learning Across the Lifespan**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 255; BIOL 256; (PSYCH 101 or PSYCH 230)*

Introduction to major concepts of neuromotor control, behavioral motor control and motor learning in the child, adult and older adult, with emphasis on the adult system.

**KIN 373: Biomechanics and Motor Control Laboratory**

(0-2) Cr. 1.

*Prereq: Credit or concurrent enrollment in (KIN 355; KIN 372)*

Introduction to lab techniques in Biomechanics and Motor Control by engaging in the experimental process. Reinforces and integrates concepts from KIN 355 and KIN 372. Performance of hands-on collection of biomechanical and motor control data and analysis and explanation of human movement from mechanical, behavioral, and neural perspectives.

**KIN 381A: Study Abroad Experience in Kinesiology: Preparing for the Experience**

Cr. 1. Alt. S., offered even-numbered years.

*Prereq: KIN 252; KIN 253; major in A TR or KIN; Sophomore classification; minimum GPA of 2.5*

Prepares student for a study abroad experience focused on the discipline of Kinesiology in another country. Precedes a multi-credit KIN 381B course that is the actual study abroad experience. The prerequisite for this course is having been accepted to study abroad by the Program Director of your intended program. Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

**KIN 381B: Study Abroad Experience In Kinesiology**

Cr. 2. Alt. SS., offered even-numbered years.

*Prereq: KIN 381A; Permission of Instructor*

First-person perspective into the discipline of Kinesiology in another country as well as provide enrichment experiences related to the history and culture of that country. Follows a 1 credit KIN 381A course that was intended to prepare you for this study abroad experience. Offered on a satisfactory-fail basis only.

Meets International Perspectives Requirement.

**KIN 385: Preparation and Search Strategies for Kinesiology and Health Internships**

(Cross-listed with H S). Cr. 0.5. F.S.

*Prereq: Junior classification*

Preparation of relevant material for a successful internship/career search. Specific internship timeline, process, procedures will be reviewed. Course needs to be taken a minimum of two semesters prior to required internship.

**KIN 391: Service Learning Leadership Experience**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

Applied service learning experiences designed to provide students with opportunities to apply classroom knowledge to real world applications. Students will gain professional skills and programming experience while supporting health, education and wellness programming in school, work site or community settings. Offered on a satisfactory-fail basis only.

**KIN 395: Adapted Physical Education**

(Dual-listed with KIN 595). (2-2) Cr. 3. F.

*Prereq: Admission to Education Preparation Program*

Etiology, characteristics, needs, and movement experiences for individuals with disabilities. Designed to provide appropriate methods of physical education instruction for students including those with disabilities as identified by the Individuals with Disabilities Education Act and students who are talented and gifted. Assessments and strategies to differentiate instruction and to adapt activities for all exceptional learners will be addressed. Laboratory experience required. KIN 595 may not be taken by students who previously earned credit in KIN 395.

**KIN 399: Recreational Sport Management**

(3-0) Cr. 3. F.

*Prereq: SOC 134*

The role of sport in developing fitness, recreational opportunities, and tourism, with special emphasis on issues related to youth sport, volunteerism, and the marketing of sport events and facilities.

**KIN 417: Supervised Teaching in Physical Education in the Secondary School**

Cr. arr. F.S.

*Prereq: KIN 281; KIN 282; KIN 313; KIN 355; KIN 395; KIN 471; KIN 475; (Physical Education Teacher Education Specialization or Admission to Education Preparation Program); Permission of Advisor*

Supervised teaching in the secondary schools.

### **KIN 418: Supervised Teaching in Physical Education in the Elementary School**

Cr. 8. F.S.

*Prereq: KIN 280; KIN 282; KIN 312; KIN 355; KIN 395; KIN 471; KIN 475; (Physical Education Teacher Education Specialization or Admission to Education Preparation Program); Permission of Advisor*

Supervised teaching in the elementary schools.

### **KIN 455: Research Topics in Biomechanics**

(3-0) Cr. 3.

*Prereq: KIN 355 or Permission of Instructor*

Examination of biomechanics and kinesiology research literature to evaluate the application of mechanical principles and analyses to human movement in exercise, sport, physical activity, and activities of daily living and to assess research outcomes and their implications for motor performance, movement energetic, musculoskeletal loading, and injury.

### **KIN 458: Principles of Fitness Assessment and Exercise Prescription**

(3-2) Cr. 4. F.S.

*Prereq: Minimum of C- in KIN 358*

Principles of cardiac risk factor identification and modification; risk classification of potential exercise clients; fitness assessments; developing comprehensive exercise prescriptions for individuals.

### **KIN 459: Internship in Exercise Leadership**

(0-3) Cr. 1. F.S.

*Prereq: C- or better in KIN 259; credit or concurrent enrollment in KIN 458*

Observation and practice of exercise leadership techniques in an on-campus adult fitness program.

### **KIN 462: Medical Aspects of Exercise**

(3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in KIN 358*

The role of exercise in preventive medicine. Impact of exercise on various diseases, and the effect of various medical conditions on the ability to participate in vigorous exercise and competitive sports. Principles of exercise testing and prescription for individuals with these conditions. Environmental and nutritional aspects of exercise.

### **KIN 466: Exercise for Mental Health**

(3-0) Cr. 3. S.

*Prereq: KIN 366 or Senior classification in Psychology or Permission of Instructor*

Understand the state-of-the-knowledge of the mental health benefits of physical activity both in the prevention and in the treatment of clinical mental health and other psychological conditions. Focus on both the neurobiological bases of mental health disorders and the effects of exercise on these factors. Practical approach to encouraging changes in physical activity across populations suffering from psychological disturbances as part of treatment.

### **KIN 467: Exercise and Health: Behavior Change**

(Dual-listed with KIN 567). (3-0) Cr. 3. F.S.

*Prereq: KIN 366 or Permission of Instructor*

Advanced analysis of theoretical health behavior models and their application to physical activity behavior. Includes practical techniques, tools and interventions (e.g., counseling skills, motivational interviewing) to enhance exercise prescription and motivation, and considerations for working with special populations.

### **KIN 471: Measurement in Physical Education**

(Dual-listed with KIN 571). (3-0) Cr. 3. S.

*Prereq: Admission to Education Preparation Program*

Current theory, practice and research on measurement and evaluation in physical education and youth physical activity settings. Statistics, grading, and specific assessments including fitness, motor skill, sport skill, physical activity, affective, and cognitive testing will be addressed. KIN 571 may not be taken by students who previously earned credit in KIN 471.

### **KIN 472: Neural Basis of Human Movement**

(Dual-listed with KIN 572). (3-0) Cr. 3. F.S.

*Prereq: KIN 372 or PSYCH 310*

Addresses the role of the central nervous system in the control of voluntary human movement, with the focus on the cerebral cortex, basal ganglia and cerebellum. Content organized around specific nervous system damage (such as stroke, apraxia, spasticity, or spinal cord damage) and functional movements (such as reaching and grasping, balance and gait). Converging evidence from human movement disorders, brain imaging, animal lesion and single cell studies provide the primary basis for the content.

### **KIN 473: Physical Dimensions of Aging**

Cr. 3. S.

*Prereq: KIN 355 or KIN 358 or KIN 372*

Understanding the physiological, behavioral, and cognitive changes associated with aging with focus on the effects of physical activity on the aging human system. Discussions of what it means to become older, what a person can expect during the aging process, and what kind of control a person has over the aging process.

### **KIN 475: Physical Education Curriculum Design and Program Organization**

(Dual-listed with KIN 575). (3-0) Cr. 3. F.

*Prereq: KIN 280; KIN 281; Admission to Educator Preparation Program*

Current theory, practices and principles applied to curriculum development for programs in physical education, K-12. Organizing for teaching in a variety of school settings.



**KIN 480: Functional Anatomy**

(3-0) Cr. 3. F.S.

*Prereq: (BIOL 155 or BIOL 255); BIOL 256; KIN 355*

The structure and function of human muscular, skeletal and nervous systems. The relationship of these systems to efficient and safe human motion.

**KIN 481: Biomechanics Lab**

(0-2) Cr. 1.

*Prereq: KIN 355*

Learning lab techniques in Biomechanics and engaging in the experimental process.

**KIN 483: Exercise Psychology Lab**

(0-2) Cr. 1.

*Prereq: KIN 366*

Learning lab techniques in Exercise Psychology and engaging in the experimental process.

**KIN 484: Assessment and Control of Locomotion**

(0-2) Cr. 1.

*Prereq: KIN 372*

Learning lab techniques in Motor Control and engaging in the experimental process.

**KIN 485: Internship in Kinesiology**

Cr. 8-12.

*Prereq: Senior classification; Exercise Science specialization; C- or better in (KIN 355; KIN 358; KIN 359; KIN 366; KIN 372; KIN 458; KIN 459; KIN 462; H S 350); Cumulative GPA 2.0; Permission of Internship Coordinator*

Observation and practice in exercise/fitness agencies. Offered on a satisfactory-fail basis only.

**KIN 485A: Internship in Exercise Science**

Cr. 8-12. F.S.SS.

*Prereq: Senior classification; Exercise Science specialization; C- or better in (KIN 355; KIN 358; KIN 359; KIN 366; KIN 372; KIN 458; KIN 459; KIN 462; H S 350); Cumulative GPA 2.0; Permission of Internship Coordinator*

Observation and practice in selected exercise science agencies. Offered on a satisfactory-fail basis only.

**KIN 485G: Internship in Kinesiology: General**

Cr. 8-12.

*Prereq: Senior classification; Exercise Science specialization; C- or better in (KIN 355; KIN 358; KIN 359; KIN 366; KIN 372; KIN 458; KIN 459; KIN 462; H S 350); Cumulative GPA 2.0; Permission of Internship Coordinator*

Observation and practice in exercise/fitness agencies. Offered on a satisfactory-fail basis only.

**KIN 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

Independent study of problems of areas of interest in exercise and sport science and related areas. 6 credits from KIN advanced core recommended.

**KIN 490A: Independent Study: Exercise and Sport Science**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Permission of Instructor*

Independent study of problems of areas of interest in exercise and sport science and related areas. 6 credits from KIN advanced core recommended.

**KIN 490H: Independent Study: Honors**

Cr. 1-2. Repeatable, maximum of 4 credits.

*Prereq: Permission of Instructor*

Independent study of problems of areas of interest in exercise and sport science and related areas. 6 credits from KIN advanced core recommended.

**KIN 491: Undergraduate Teaching Experience**

Cr. 1-2. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior classification or higher; Permission of Instructor*

Undergraduate teaching assistant opportunity in Kinesiology. Offered on a satisfactory-fail basis only.

**KIN 494: Practicum in Motivational Interviewing for Health**

Cr. 1-2. Repeatable, maximum of 6 credits. F.S.

*Prereq: Junior classification or higher; Permission of Instructor*

This supervised practicum course is designed for students interested in learning how to conduct 'motivational interviewing' for behavior change and health coaching applications. Students will learn strategies of motivational interviewing and have opportunities to practice applying these skills with adult clients. Offered on a satisfactory-fail basis only.

**KIN 494A: Practicum in Motivational Interviewing for Health: Principles of Motivational Interviewing**

Cr. 1. F.S.SS.

*Prereq: Junior classification or higher; Permission of Instructor*

Introduction to the principles of 'motivational interviewing' for behavior change and health coaching applications. Students interested in gaining practical experience in health coaching should enroll in the associated practicum course (KIN 494B). Offered on a satisfactory-fail basis only.

**KIN 494B: Practicum in Motivational Interviewing for Health: Supervised Experience**

Cr. 1-2. Repeatable, maximum of 5 credits. F.S.

*Prereq: KIN 494A; Permission of Instructor*

This supervised practicum course is designed for students interested in gaining experience in applying 'motivational interviewing' strategies in behavior change and health coaching applications. Students will have opportunities to practice motivational interviewing skills with adult clients and receive on-going support and assistance needed to refine their skills. Offered on a satisfactory-fail basis only.

**KIN 495: Special Topics in Kinesiology**

Cr. 1-3.

*Prereq: Junior classification or higher*

Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**KIN 501: Research Methods in Physical Activity**

(3-0) Cr. 3. Repeatable.

*Prereq: Graduate classification in kinesiology and health*

Methods and techniques used in the design and interpretation of research involving physical activity. Emphasis on styles of writing, library use, and computer applications.

**KIN 505: Research Laboratory Techniques in Exercise Physiology**

(1-4) Cr. 3.

*Prereq: KIN 358 or equivalent course with basic laboratory experience*

Application and use of laboratory research equipment in exercise physiology, including operation, calibration, and use in selected situations.

**KIN 510: Advanced Medical Aspects of Exercise**

(2-0) Cr. 2.

*Prereq: KIN 358*

The role of exercise in preventive medicine. Impact of exercise on various diseases, and the effect of various medical conditions on the ability to participate in vigorous exercise and competitive sports. Principles of exercise testing and prescription for individuals with these conditions.

**KIN 511: Physical Activity Strategies for Youth**

Cr. 3.

Provide adequate opportunities to develop a more in-depth understanding of (a) the challenges in youth physical activity (PA), (b) the relevant theoretical models that are popular in youth PA, (c) the strategies that can be implemented to promote PA in youth.

**KIN 512: Movement Education in Elementary School Physical Education**  
(2-2) Cr. 3. F.

Planning for management and instruction of developmentally appropriate physical education for children pre-school through grade six. Laboratory experience required. Emphasis on evaluating published research on physical education and school-wide physical activity.

**KIN 515: Injury Biomechanics**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Kin 355 or permission of instructor.*

Utilization of biomechanical principles to model injury mechanisms. Introduction to tissue mechanics of bone, articular cartilage, ligament, tendon, muscle, and nerve. Biomechanics of lower extremity, upper extremity, and head/neck/trunk injuries.

**KIN 516: Quantitative Analysis of Human Movement**

(3-1) Cr. 3.

*Prereq: KIN 355*

Application of the principles of mechanics to the analysis of human motion. Investigation of the effects of kinematics and kinetics on the human body with special emphasis on exercise and sport applications. Includes consideration of two-dimensional and three-dimensional imaging techniques and force measurements.

**KIN 517: Musculoskeletal Modeling**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: KIN 355 or permission from instructor*

Systematic problem-solving approaches and design of computer programs for biomechanical analyses. Estimation of anthropometric parameters and mechanical properties of muscles, bones, and joints. Integration of anthropometrics, kinematics, EMG, and muscle mechanics into simulations of human movement.

**KIN 518: Student Teaching in Elementary Physical Education**

(0-8) Cr. 8. F.S.

*Prereq: KIN 512, KIN 570, KIN 575*

Student teaching for 8 weeks in an elementary school.

**KIN 519: Student Teaching in Secondary Physical Education**

(0-8) Cr. 8. F.S.

*Prereq: KIN 512, KIN 570, KIN 575*

Student teaching for 8 weeks in a middle or high school.

**KIN 521: Advanced Topics in Exercise and Sport Psychology**

(3-0) Cr. 3.

*Prereq: KIN 365 or KIN 366, 3 courses in psychology; open to majors only or by permission of instructor*

Aspects of psychology which form a basis for understanding and explaining behavior in the context of exercise and sport. Emphasis on evaluating published research, particularly theory and research methodology. Student presentations.

**KIN 549: Advanced Vertebrate Physiology I**

(Cross-listed with AN S, NUTRS). (4-0) Cr. 4. F.

*Prereq: recommended: an undergraduate physiology course and a biochemistry course*

Overview of mammalian physiology. Cell biology, endocrinology, cardiovascular, respiratory, immune, digestive, skeletal muscle and reproductive systems.

**KIN 550: Advanced Physiology of Exercise I**

(2-3) Cr. 3.

*Prereq: KIN 505*

Analysis of factors affecting work capacity and performance. Concepts and measurement of human energy metabolism and bioenergetic adaptations to training.

**KIN 551: Advanced Physiology of Exercise II**

(2-3) Cr. 3.

*Prereq: KIN 505*

Analysis of factors affecting cardiovascular and respiratory function in response to multiple stressors including exercise. Influence of environment will also be discussed.

**KIN 560: Principles of Neuromotor Control and Learning**

(2-3) Cr. 3.

*Prereq: KIN 372*

Theoretical perspectives of neuromotor control and learning will be examined as well as factors that facilitate motor learning. Neuromotor control and learning will also be addressed by studying functional tasks such as reach-to-grasp and locomotion.

**KIN 561: Motor Development and Physical Activity**

(2-0) Cr. 2-3.

*Prereq: PSYCH 230*

Addresses theories and underlying mechanisms of motor development and motor control applied to typically and atypically developing children. Developmental control of balance, locomotion, reach-to-grasp, and other functional skills will be discussed, as will the role of physical activity in a child's life.

**KIN 567: Exercise and Health: Behavior Change**

(Dual-listed with KIN 467). (3-0) Cr. 3. F.S.

*Prereq: KIN 366 or Permission of Instructor*

Advanced analysis of theoretical health behavior models and their application to physical activity behavior. Includes practical techniques, tools and interventions (e.g., counseling skills, motivational interviewing) to enhance exercise prescription and motivation, and considerations for working with special populations.

**KIN 570: Physical Activity Assessment for Health Related Research**

(2-2) Cr. 3.

This course will cover the broad scope of research in physical activity and public health. Emphasis will be placed on the application of physical activity assessment techniques since accurate measures are needed to more accurately assess the health benefits from physical activity and to evaluate the effectiveness of behavioral interventions designed to promote physical activity.

**KIN 571: Measurement in Physical Education**

(Dual-listed with KIN 471). (3-0) Cr. 3. S.

*Prereq: Admission to Education Preparation Program*

Current theory, practice and research on measurement and evaluation in physical education and youth physical activity settings. Statistics, grading, and specific assessments including fitness, motor skill, sport skill, physical activity, affective, and cognitive testing will be addressed. KIN 571 may not be taken by students who previously earned credit in KIN 471.

**KIN 572: Neural Basis of Human Movement**

(Dual-listed with KIN 472). (3-0) Cr. 3. F.S.

*Prereq: KIN 372 or PSYCH 310*

Addresses the role of the central nervous system in the control of voluntary human movement, with the focus on the cerebral cortex, basal ganglia and cerebellum. Content organized around specific nervous system damage (such as stroke, apraxia, spasticity, or spinal cord damage) and functional movements (such as reaching and grasping, balance and gait). Converging evidence from human movement disorders, brain imaging, animal lesion and single cell studies provide the primary basis for the content.

**KIN 575: Physical Education Curriculum Design and Program Organization**

(Dual-listed with KIN 475). (3-0) Cr. 3. F.

*Prereq: KIN 280; KIN 281; Admission to Educator Preparation Program*

Current theory, practices and principles applied to curriculum development for programs in physical education, K-12. Organizing for teaching in a variety of school settings.

**KIN 590: Special Topics**

Cr. 1-3. Repeatable.

**KIN 590A: Special Topics: Physical Education**

Cr. 1-3. Repeatable.

**KIN 590B: Special Topics: Health and Exercise Promotion**

Cr. 1-3. Repeatable.

**KIN 590D: Special Topics: Exercise Physiology**

Cr. 1-3. Repeatable.

**KIN 590E: Special Topics: Sport Sociology**

Cr. 1-3. Repeatable.

**KIN 590F: Special Topics: Sport/Exercise Psychology**

Cr. 1-3. Repeatable.

**KIN 590G: Special Topics: Motor Behavior**

Cr. 1-3. Repeatable.

**KIN 590H: Special Topics: Biomechanics**

Cr. 1-3. Repeatable.

**KIN 590I: Special Topics: Research Ethics**

Cr. 1-3. Repeatable.

**KIN 591: Supervised Field Experience**

Cr. 1-6.

*Prereq: 10 graduate credits in kinesiology and/or related areas*

Supervised on-the-job field experience in special areas.

**KIN 591A: Supervised Field Experience: Physical Education**

Cr. 1-6.

*Prereq: 10 graduate credits in kinesiology and/or related areas*

Supervised on-the-job field experience in special areas.

**KIN 591B: Supervised Field Experience: Health and Exercise Promotion**

Cr. 1-6.

*Prereq: 10 graduate credits in kinesiology and/or related areas*

Supervised on-the-job field experience in special areas.

**KIN 591D: Supervised Field Experience: Exercise Physiology**

Cr. 1-6.

*Prereq: 10 graduate credits in kinesiology and/or related areas*

Supervised on-the-job field experience in special areas.

**KIN 592: Practicum in College Teaching**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

Supervised experience with teaching an upper division, classroom-based course. Offered on a satisfactory-fail basis only.

**KIN 595: Adapted Physical Education**

(Dual-listed with KIN 395). (2-2) Cr. 3. F.

*Prereq: Admission to Education Preparation Program*

Etiology, characteristics, needs, and movement experiences for individuals with disabilities. Designed to provide appropriate methods of physical education instruction for students including those with disabilities as identified by the Individuals with Disabilities Education Act and students who are talented and gifted. Assessments and strategies to differentiate instruction and to adapt activities for all exceptional learners will be addressed. Laboratory experience required. KIN 595 may not be taken by students who previously earned credit in KIN 395.

**KIN 599: Creative Component**

Cr. 1-3. Repeatable.

**Courses for graduate students:****KIN 615: Seminar**

Cr. 1-3. Repeatable.

**KIN 620: Advance Research Methods in Physical Activity**

(3-0) Cr. 3. S.

*Prereq: KIN 501, STAT 402 and STAT 587. Doctoral students only*

Culminating seminar designed to synthesize statistical and design courses with practical research issues using data from physical activity.

**KIN 661: Advanced Topics in Neuroscience**

(Cross-listed with BBMB, GDCB, NEURO). (3-0) Cr. 3. Repeatable. Alt. S., offered even-numbered years.

*Prereq: NEURO 556 (or comparable course) or permission of instructor*

Students will present three journal articles and two overview lectures on topics in neuroscience that are related but outside of their own research interest.

**KIN 670: Molecular Biology of Muscle**

(Cross-listed with AN S). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: BBMB 405, BBMB 420*

Ultrastructure of muscle; chemistry, structure, function, and molecular biology of muscle proteins. Molecular aspects of muscle contraction, development and turnover. Cytoskeletal proteins and dynamics.

**KIN 699: Research**

Cr. 1-6. Repeatable.

## Landscape Architecture (L A)

***Any experimental courses offered by L A can be found at:***

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**L A 171: City Play!**

(3-0) Cr. 3.

Exploration of play in cities. Introduction to two important concepts: how play has become a central theme in the economic development and sustainability of cities around the world; and, how the design of cities needs to make room for equitable access to play for everyone.

**L A 201: Studio: Landscape Interpretation and Representation**

(0-12) Cr. 6. F.

*Prereq: Enrollment in the professional program*

Reading and representing varied landscapes; development of aesthetic sensitivity to the geomorphology, vegetation, and cultural influences on these landscapes. Small-scale interventions and exploration of landscape phenomena and change. Emphasis on a variety of documentation and drawing techniques.

**L A 202: Studio: Site Design I**

(0-12) Cr. 6. S.

*Prereq: L A 201*

Fundamental issues of landscape planning and design at a site scale. Projects introduce a variety of (objective and subjective) site inquiry methods, space and place making, and sensitive integration of architecture and landscape for specific land uses. User needs, precedent study, programming, site engineering, planting design, and outdoor space design expressed through a variety of three-dimensional modeling, graphic, and written media.

**L A 211: Digital Design Methods for Landscape Architecture**

(Cross-listed with C R P). (3-0) Cr. 3. S.

Foundational knowledge and basic skills in 2D, 3D, and 4D computer applications used for design development and communication, with emphasis on 3D modeling and workflow interoperability.

**L A 221: Native Plants of the Savanna Ecotone**

(2-3) Cr. 3. F.

*Prereq: Enrollment in the professional program*

Observation and study of the wetland, prairie, and woodland vegetation native to the savanna ecotone. Emphasis on plant communities, their distribution, structure, habitat and aesthetics. Plant identification and use in landscape design. Precedent and case studies of vegetation preservation, restoration and use in built works.

**L A 222: Introduced Plants of the Midwest**

(2-3) Cr. 3. S.

*Prereq: L A 221*

Identification, observation, and study of plants introduced to cultivation in the Midwest region. Plant cultural requirements, including adaptations to climate changes, solar exposure, and soil conditions. Investigation of history of plant introduction and use in designed landscape, including consequent impacts of plant introduction such as plant invasion. Introduction to planting design at the site scale, including matching plant cultural requirements to site conditions, functional uses of plants and expressive composition using plant form, texture and color.

**L A 241: Developing Identity as a Landscape Architect**

(1-0) Cr. 1. F.

*Prereq: Enrollment in the professional program*

Development of life skills for conflict resolution, effective interpersonal communication, and CPR/First Aid. Examination of personal values as they relate to the backgrounds, abilities, attitudes, and values of others; exploration of how these influence personal decision-making and group interaction. Reading, discussion, class activities, journal-keeping, writing. Offered on a satisfactory-fail basis only.

**L A 270: Foundations in Natural Resource Policy and History**

(Cross-listed with ENV S, NREM). (3-0) Cr. 3. F.

The development of natural resource conservation philosophy and policy from the Colonial Era to the present. North American wildlife, forestry, and environmental policy; national parks and other protected lands; federal and state agencies. Relationship to cultural contexts, including urban reform and American planning movement. Discussion of common pool resources, public and private lands.

**L A 272: Landscape Studies**

(3-0) Cr. 3. F.

*Prereq: Enrollment in the professional program*

Exploration of landscapes, from broad settlement patterns to individual sites. Investigation of relationships between vernacular and designed landscapes. Landscapes considered as modes of cultural production that shape and are shaped by social, political, and economic processes. Lectures, reading, field studies, and writing.

**L A 274: The Social and Behavioral Landscape**

(3-0) Cr. 3. S.

Exploration of social and behavioral factors pertinent to design of the domestic, civic, and commercial landscape. Focus on working familiarity with design principles as they relate to the behavior and activities of people across a broad demographic and cultural spectrum; application of these principles to design of outdoor environments. Lectures and discussions, including group exercises and field trips.

**L A 281: Investigating Landscape Form, Process, and Detail**

(1-6) Cr. 3. F.

*Prereq: Enrollment in professional program*

Exploration of the poetics and principles of landscape construction.

Investigation and interpretation of landform and geomorphic processes such as the hydrologic cycle, erosion, and sedimentation. Close observation and representation of detail design, with an emphasis on material types, their connections, and weathering. Readings, field studies, and drawings in analog and digital media.

**L A 282: Landscape Dynamics**

(2-2) Cr. 3. S.

*Prereq: Sophomore classification*

Understand design implications presented by geotechnical and ecological processes in the landscape including ecology, vegetation, soils and water. Understand the influence of landforms, geology, plants, soils, and water on the creation of landscape designs. Course relates current issues including water quality impairment, erosion, and invasive species with design strategies such as stormwater management, soil quality management, and plant community restoration. Field trips.

**L A 301: Site Design II**

(0-12) Cr. 6. F.

*Prereq: L A 202*

Development of half-acre to hundred-acre landscape design and planning proposals, potentially in collaboration with students in other programs. Apply critical methodological frameworks to shape site systems while providing appropriate support for diverse user groups and creating culturally meaningful places. Assess and interpret a program of use, organize subjective and objective site inventory and analysis, develop functional and poetic design strategies for infrastructure and natural systems, and craft artistic and functionally explicit landscape architectural proposals. Development of appropriate technique and high level of craft in representations to support design thinking process and final scheme presentation.

**L A 302: Ecological Design**

(0-12) Cr. 6. S.

*Prereq: L A 301, L A 381 and NREM 120*

Exploration and application of ecological theories and processes in design and planning to include hundred plus-acre scale in urban, urban fringe, and rural landscapes. Apply advanced landscape analysis of soil, water, topography, and vegetation utilizing geographic information systems with an emphasis on inventory and analysis mapping.

**L A 309: Field Travel**

Cr. 1. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Enrollment in the professional program and permission of instructor*

Observation of and reflection on professional practice and landscapes in urban, rural, and wilderness areas. Offered on a satisfactory-fail basis only.

**L A 322: Fundamentals of Planting Design**

(2-3) Cr. 3.

*Prereq: L A 221*

The art and techniques of creating plant compositions in the landscape that respond to cultural and biophysical contexts. Investigation of soil properties and plant/soil relationships relevant to the built environment. Methods of site inventory and analysis, developing plant palettes and composing plant assemblages that address expressive and functional needs. Introduction to the techniques of preparing planting plans, including standards for plant selection, plant lists and plant specification.

**L A 341: Contemporary Landscape Architecture**

(1-0) Cr. 1. S.

*Prereq: L A 301*

Exploration of contemporary landscape architectural practice through individualized research into practicing firms. Preparation of paper and presentation outlining broad framework and specific parameters of a selected area of contemporary practice using specific projects as examples. Work may result in invitation of current practitioner(s) as a lecture series or event. Resume and portfolio preparation in advance of required off-campus semester (L A 444 A, B or C).

**L A 371: History of Modern Landscapes, 1750 to Present**

(3-0) Cr. 3. S.

Investigation of landscape design concepts and trends as observed over time, from approximately 1750 to the present, with emphasis on the United States and Europe. Examination of significant figures and outstanding works (sites, gardens, landscapes, monuments, subdivisions, city plans, etc.) of varied geographic regions. Analysis of the social, economic, political, and technical forces contributing to the development of landscape design styles, vocabulary, and literature. Lectures, readings, projects, research papers.

**L A 373: Gardens and Landscapes from Antiquity to 1750**

(3-0) Cr. 3. F.

Investigation of international landscape design concepts and trends as observed over time, from pre-history to the mid 18th century. Examination of significant figures and outstanding works (sites, gardens, landscapes, monuments, subdivisions, city plans, etc.) of varied geographic regions. Analysis of the social, economic, political, and technical forces contributing to the development of landscape design styles, vocabulary, and literature. Lectures, readings, projects, research papers. Meets International Perspectives Requirement.



**L A 381: Shaping the Land**

(3-0) Cr. 3. F.

*Prereq: MATH 140, MATH 143, MATH 145, or MATH 165*

Design of landforms to achieve aesthetic, functional, and safety goals. Landform changes to accommodate human uses and activities. Impacts and implications of landform transformation on the surrounding environment. Surface and subsurface drainage design, storm water runoff best management practices, contour manipulation to incorporate slopes, swales, culverts, pads, retaining walls, walks, steps, terraces, buildings, and other structures in the landscape. Road layout and alignment, parking lot design, and earthwork volume estimates. Design communication using CAD, perspectives, cross-sections, contour maps, landform models, and narratives. Class exercises, case study precedents, and preliminary construction documents.

**L A 401: Community Design**

(0-12) Cr. 6. F.

*Prereq: L A 402*

Physical planning and design of places utilizing community-based methods. Projects address social and cultural dimensions of placemaking such as reuse of abandoned sites, in-fill development, and community visioning. Emphasis on development of user-client relationship skills and design research. Integrated seminar component.

**L A 401H: Community Design: Honors**

(0-12) Cr. 7. F.

*Prereq: L A 402*

Physical planning and design of places utilizing community-based methods. Projects address social and cultural dimensions of placemaking such as reuse of abandoned sites, in-fill development, and community visioning. Emphasis on development of user-client relationship skills and design research. Integrated seminar component.

**L A 402: Urban Design**

(0-12) Cr. 6. F.

*Prereq: L A 302*

Comprehensive planning and design for urban sites or for sites within urban contexts. Projects typically include planning for a variety of integrated land uses, and cover the full range of design scales from master planning to proposals for site details. Emphasis on written and verbal as well as graphic communications. Integrated seminar component.

**L A 402H: Urban Design: Honors**

(0-12) Cr. 7. F.

*Prereq: L A 302*

Comprehensive planning and design for urban sites or for sites within urban contexts. Projects typically include planning for a variety of integrated land uses, and cover the full range of design scales from master planning to proposals for site details. Emphasis on written and verbal as well as graphic communications. Integrated seminar component.

**L A 403H: Senior Thesis Preparation Tutorial**

Cr. 2. F.

*Prereq: L A 402, Permission of Thesis Advisor, enrollment in Honors program*  
Preparation for senior thesis.

**L A 404: Advanced Landscape Architectural Design**

(0-12) Cr. 6. Repeatable, maximum of 2 times. F.

*Prereq: L A 402*

Advanced forum for the demonstration of sophistication in landscape architectural design. Experimentation and innovation are encouraged.

**L A 404H: Advanced Landscape Architectural Design: Honors**

(0-12) Cr. 6-7. Repeatable, maximum of 2 times. F.

*Prereq: LA 402*

Advanced forum for the demonstration of sophistication in landscape architectural design. Experimentation and innovation are encouraged.

**L A 405H: Senior Thesis**

(0-15) Cr. 6.

*Prereq: L A 401, L A 402, L A 403, enrollment in Honors program and permission of advisor, chair and thesis advisor.*

Individual advanced forum for the demonstration of sophistication in landscape architectural design. Experimentation and innovation are expected.

**L A 442: Professional Practice**

(Dual-listed with L A 542). (2-0) Cr. 2. S.

*Prereq: L A 481*

Studies of conventional and developing forms of public and private practice. Explore relationships between professional life and the culture of the professional design firm; investigate firm identities and structures; understand design projects, their delivery process, and contractual agreements. Lecture and class discussion.

**L A 444: Landscape Architecture Independent Educational Enrichment**

Cr. R. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 341 or Permission of Advisor and Chair*

Independent educational enrichment through exploration of landscape architectural practice in a professional internship, international studies, or out-of-region national study experience.

**L A 444A: Landscape Architecture Independent Educational Enrichment: Professional Internship**

Cr. R. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 341 or Permission of Advisor and Chair*

Independent educational enrichment through exploration of landscape architectural practice in a professional internship, international studies, or out-of-region national study experience.

**L A 444B: Landscape Architecture Independent Educational Enrichment: Study Abroad**

Cr. R. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 341 or Permission of Advisor and Chair*

Independent educational enrichment through exploration of landscape architectural practice in a professional internship, international studies, or out-of-region national study experience.

**L A 444C: Landscape Architecture Independent Educational Enrichment: National Student Exchange**

Cr. R. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 341 or Permission of Advisor and Chair*

Independent educational enrichment through exploration of landscape architectural practice in a professional internship, international studies, or out-of-region national study experience.

**L A 454: Fundamentals of Remote Sensing and Spatial Analysis**

(Dual-listed with L A 554). (Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: C R P 351*

Introduction to image processing techniques needed for analysis of optical remote sensing imagery, including filtering, enhancement, and classification. Analysis of elevation surfaces, hydrology, distance, overlays and visual programming with Model Builder. Practical applications in a variety of topics to understand how to analyze imagery.

**L A 459: Digital Design Methods for Landscape Architecture**

(Dual-listed with L A 559). (3-0) Cr. 3. S.

Introduction to digital tools used by landscape architects for design communication, visualization, and design development, with emphasis on 3D modeling and workflow interoperability.

**L A 478: Topical Studies in Landscape Architecture**

(Dual-listed with L A 578). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**L A 478A: Topical Studies in Landscape Architecture: Landscape Design**

(Dual-listed with L A 578A). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478B: Topical Studies in Landscape Architecture: Planting Design**

(Dual-listed with L A 578B). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478C: Topical Studies in Landscape Architecture: Construction**

(Dual-listed with L A 578C). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478D: Topical Studies in Landscape Architecture: History/Theory/Criticism**

(Dual-listed with L A 578D). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478E: Topical Studies in Landscape Architecture: Landscape Planning**

(Dual-listed with L A 578E). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478F: Topical Studies in Landscape Architecture: Urban Design**

(Dual-listed with L A 578F). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478G: Topical Studies in Landscape Architecture: Graphics**

(Dual-listed with L A 578G). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478H: Topical Studies in Landscape Architecture: Honors**

Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478I: Topical Studies in Landscape Architecture: Interdisciplinary Studies**

(Dual-listed with L A 578I). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478J: Topical Studies in Landscape Architecture: International Studies**

(Dual-listed with L A 578J). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 478K: Landscape Architecture: Computer Applications**

(Dual-listed with L A 578K). Cr. 2-3. Repeatable. F.S.SS.

*Prereq: Senior classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**L A 478L: Topical Studies in Landscape Architecture: Ecological Design**

(Dual-listed with L A 578L). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 478M: Topical Studies in Landscape Architecture: Landscape Architecture: Social/Behavioral**

(Dual-listed with L A 578M). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 478N: Topical Studies in Landscape Architecture: Natural Resources**

(Dual-listed with L A 578N). Cr. 2-3. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 481: Landscape Construction**

(3-0) Cr. 3. F.

*Prereq: L A 381*

Development of construction details with an emphasis on the aesthetic and functional use of landscape materials. Explore characteristics, applications, systems, and uses of wood, paving, walls, masonry, concrete, and metals in the landscape. Preliminary preparation of construction documents and design documentation software.

**L A 482: Landscape Construction Documentation**

(3-0) Cr. 3. S.

*Prereq: L A 481*

Development of advanced construction documents, including documentation processes, cost estimation, sheet coordination, and specification writing. Emphasis on documentation software as a tool for design communication.

**L A 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490A: Independent Study: Landscape Design**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490B: Independent Study: Planting Design**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490C: Independent Study: Construction**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490D: Independent Study: History/Theory/Criticism**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490E: Independent Study: Landscape Planning**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490F: Independent Study: Urban Design**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490G: Independent Study: Graphics**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490H: Independent Study: Honors**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490I: Independent Study: Interdisciplinary Studies**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490J: Independent Study: International Studies**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490K: Independent Study: Computer Applications**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490L: Independent Study: Ecological Design**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490M: Independent Study: Social/Behavioral**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 490N: Independent Study: Natural Resources**

Cr. 1-6. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Written approval of instructor and department chair on required form*  
Investigation of a topic of special interest to the student.

**L A 491: Environmental Law and Planning**

(Dual-listed with L A 591). (Cross-listed with C R P, ENV S). (3-0) Cr. 3. S.

*Prereq: 6 credits in natural sciences or Permission of Instructor*  
Environmental law and policy as applied in planning at the local and state levels. Brownfields, environmental justice, water quality, air quality, wetland and floodplain management, and local government involvement in ecological protection through land use planning and other programs.

**Courses primarily for graduate students, open to qualified undergraduates:**

**L A 509: Field Travel**

Cr. 1. Repeatable, maximum of 2 times.

*Prereq: Enrollment in the professional program and permission of instructor*  
Observation of and reflection on professional and academic practice and landscapes. Field study and travel to conferences and educational events. Reading and final report. Offered on a satisfactory-fail basis only.

**L A 522: Advanced Plant Technology**

(2-2) Cr. 3. F.

*Prereq: Junior or graduate standing*

Introduction to the science that supports green technologies. Plant and soil design for performance in the built environment. Design studies and lab explorations will complement readings, lecture and project case study presentations by practitioners. Green streets, green roofs, bio-phyto-remediation and other technologies are introduced. Final project integrates scientific and technical knowledge in a holistic landscape design.

**L A 541: Design Inquiry**

(3-0) Cr. 3. S.

*Prereq: Graduate standing*

Examination of design inquiry and introduction to research methods relevant to design. Consideration of where knowledge comes from, and how different research methods help create knowledge in various contexts. Readings, discussions, and sketch problems. Preparation of a written research proposal.

**L A 542: Professional Practice**

(Dual-listed with L A 442). (2-0) Cr. 2. S.

*Prereq: L A 481*

Studies of conventional and developing forms of public and private practice. Explore relationships between professional life and the culture of the professional design firm; investigate firm identities and structures; understand design projects, their delivery process, and contractual agreements. Lecture and class discussion.

**L A 543: Colloquium: Landscape Architecture Research**

(0-1) Cr. 1. S.

*Prereq: Graduate standing.*

Forum on current research in landscape architecture. Weekly presentation and discussion of scholarship relevant to the field. Offered on a satisfactory-fail basis only.

**L A 545: Colloquium II: Interdisciplinary Research**

Cr. 1. Repeatable. F.

*Prereq: LA 543 or graduate standing.*

Student-run graduate forum on current research in landscape architecture and related disciplines. Weekly presentations by invited faculty from the departments across the College of Design, University, and professional guests. Readings, discussions, and writing. Offered on a satisfactory-fail basis only.

**L A 554: Fundamentals of Remote Sensing and Spatial Analysis**

(Dual-listed with L A 454). (Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: C R P 351*

Introduction to image processing techniques needed for analysis of optical remote sensing imagery, including filtering, enhancement, and classification. Analysis of elevation surfaces, hydrology, distance, overlays and visual programming with Model Builder. Practical applications in a variety of topics to understand how to analyze imagery.

**L A 557: Landscape Parametrics & Design Coding**

(3-0) Cr. 3. F.

*Prereq: Graduate standing or senior status, or instructor permission.*

Introduction to parametric landscape design through computer programming of the landscape palette. Terrain, vegetation, water, weather, and lighting effects are modeled and represented algorithmically in Rhino-Grasshopper. Computational thinking, logic, and interactivity are combined to address core design principles.

**L A 558: Web Mapping and Spatial Data Visualization**

(Cross-listed with C R P). (2-2) Cr. 3.

*Prereq: CRP 451/551. GEOL 452/552 or instructor permission.*

Use and development of online mapping tools and coding to support participatory GIS, Volunteered Geographic Information, information sharing, geodesign, and decision-making actions. Geoprocessing, spatial data science, and user interface design. Laboratory emphasis on practical applications and uses of Web GIS.

**L A 559: Digital Design Methods for Landscape Architecture**

(Dual-listed with L A 459). (3-0) Cr. 3. S.

Introduction to digital tools used by landscape architects for design communication, visualization, and design development, with emphasis on 3D modeling and workflow interoperability.

**L A 571: Landscape Architectural Theory**

(3-0) Cr. 3. F.

*Prereq: graduate classification or permission of instructor*

Examination of the development of landscape architectural ideas in their historical contexts and in relation to social and cultural practices. Emphasis on exposure to key modern and contemporary texts and projects in landscape architecture, architecture, art, and related fields. Readings, discussions, and writings.

**L A 578: Topical Studies in Landscape Architecture**

(Dual-listed with L A 478). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**L A 578A: Topical Studies in Landscape Architecture: Landscape Design**

(Dual-listed with L A 478A). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578B: Topical Studies in Landscape Architecture: Planting Design**

(Dual-listed with L A 478B). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578C: Topical Studies in Landscape Architecture: Construction**

(Dual-listed with L A 478C). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578D: Topical Studies in Landscape Architecture: History/Theory/Criticism**

(Dual-listed with L A 478D). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578E: Topical Studies in Landscape Architecture: Landscape Planning**

(Dual-listed with L A 478E). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578F: Topical Studies in Landscape Architecture: Urban Design**

(Dual-listed with L A 478F). Cr. 2-3. Repeatable, maximum of 3 times.

F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578G: Topical Studies in Landscape Architecture: Graphics**

(Dual-listed with L A 478G). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578I: Topical Studies in Landscape Architecture: Interdisciplinary Studies**

(Dual-listed with L A 478I). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578J: Topical Studies in Landscape Architecture: International Studies**

(Dual-listed with L A 478J). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior or graduate classification*

Offerings vary with each term; check with department for available sections.

**L A 578K: Landscape Architecture: Computer Applications**

(Dual-listed with L A 478K). Cr. 2-3. Repeatable. F.S.SS.

*Prereq: Senior classification or graduate standing*

Offerings vary with each term; check with department for available sections. Course contact hours can range from (2-0) to (3-0) depending on number of credits.

**L A 578L: Topical Studies in Landscape Architecture: Ecological Design**

(Dual-listed with L A 478L). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 578M: Topical Studies in Landscape Architecture: Landscape Architecture: Social/Behavioral**

(Dual-listed with L A 478M). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 578N: Topical Studies in Landscape Architecture: Natural Resources**

(Dual-listed with L A 478N). Cr. 2-3. Repeatable, maximum of 3 times.  
F.S.SS.

*Prereq: L A 202 or senior classification or graduate standing*

Offerings vary with each term; check with department for available sections.

**L A 580: Thesis, Creative Component Tutorial**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Permission of major professor*

Hands-on participation in a creative or research activity in the student's area of specialization. Development of a detailed prospectus that defines the thesis or creative component.

**L A 583: Landscape TopoGraphics**

(3-0) Cr. 3. F.

*Prereq: LA 602*

Design of landforms to achieve aesthetic, functional, and safety goals. Impacts and implications of landform transformation on the surrounding environment. Design communication using CAD, perspectives, cross-sections, contour maps, landform models, and narratives. Class exercises, case study precedents, and preliminary construction documents.

**L A 587: Landscape Construction**

(1-4) Cr. 3. S.

*Prereq: L A 583*

Introduction to construction practices in landscape architecture. Emphasis on the aesthetic and functional components of built environments including materials, assemblies, and techniques. Introduction to the preparation of construction documents and design documentation software.

**L A 590: Special Topics**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Graduate standing.*

Investigation of a topic of special interest to the student.

**L A 590A: Special Topics: Landscape Design**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590B: Special Topics: Planting Design**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.



**L A 590C: Special Topics: Construction**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590D: Special Topics: History/Theory/Criticism**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590E: Special Topics: Landscape Planning**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590F: Special Topics: Urban Design**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590G: Special Topics: Graphics**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590I: Special Topics: Interdisciplinary Studies**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590J: Special Topics: International Studies**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590K: Special Topics: Computer Applications**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590L: Special Topics: Ecological Design**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590M: Special Topics: Social/Behavioral**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 590N: Special Topics: Natural Resources**

Cr. 1-6. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Approval of instructor and Director of Graduate Education on required form*

Investigation of a topic of special interest to the student.

**L A 591: Environmental Law and Planning**

(Dual-listed with L A 491). (Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: 6 credits in natural sciences or Permission of Instructor*

Environmental law and policy as applied in planning at the local and state levels. Brownfields, environmental justice, water quality, air quality, wetland and floodplain management, and local government involvement in ecological protection through land use planning and other programs.

**L A 594: Environmental Justice in Built Environments**

(3-0) Cr. 3. S.

*Prereq: Graduate standing or senior classification.*

Disproportionate environmental exposures threaten sustainable and resilient cities. Focus on cumulative effects of climate change, social exclusion, and physical isolation on vulnerable populations. Empirical research and visual surveys are synthesized into planning and design strategies for human well-being. Mapping in GIS and spatial analysis assess potential urban environmental burdens.

**L A 599: Creative Component**

Cr. 1-8. Repeatable, maximum of 8 credits. F.S.SS.

*Prereq: Permission of major professor*

Comprehensive study and original development of a project selected by the student and approved by the major professor. Completed project must be submitted to and approved by a graduate faculty committee as evidence of mastery of the principles of landscape architecture.

**Courses for graduate students:**

**L A 601: Studio I: Design Representation**

(0-12) Cr. 6. F.

*Prereq: Graduate standing*

Introduction to the techniques and conventions of landscape architectural design. Emphasis on creative space and place making at the site scale using the landscape palette. Exploration of two- and three-dimensional representation, both digital and analog, as a means of testing design ideas.

**L A 602: Studio II: Land Form and Plant Scape**

(0-12) Cr. 6. S.

*Prereq: L A 601*

Landscape design integrating knowledge of land patterns, plant ecosystems, and human processes. Project involve landform and plants at varied scale of design. Emphasis on competencies in design based in natural process, human behavior, and representation.

**L A 603: Studio III: Performance Landscapes**

(0-12) Cr. 6. S.

*Prereq: L A 602*

Theory and methods of landscape design at a variety of scales to achieve desired cultural and biophysical impacts. Development and use of performance metrics drawn from design, humanities, and science. Construction of integrated rhetorical structures of representation and analysis and critical viewpoints to create rigorous design "arguments" and meaningful, just and vibrant environments.

**L A 604: Studio IV: City Matters**

(0-12) Cr. 6. S.

*Prereq: L A 603*

Exploration of sociopolitical, ecological, and visual-spatial conditions of the urban environment through design at multiple scales. Focus on urban projects that highlight the complexity of human, ecological, and emerging infrastructural systems. Development of innovative strategies for sustainable, healthy, and just cities. Special attention is paid to new technologies and building material in cities.

**L A 605: Studio V: Land Works/Land Digits**

(0-12) Cr. 6.

*Prereq: L A 604*

Landscape design focusing on broadening the representational palette for landscape architectural concepts applied to complex sites at multiple scales. Emphasis on ideation and technical competency through advanced conceptualization, performance metrics, and skills in design research, digital representation, and teamwork.

**L A 699: Thesis Research**

Cr. 1-8. Repeatable, maximum of 8 credits. F.S.SS.

*Prereq: Permission of major professor*

Advanced and original scholarship in a specialized area. Culminates in a thesis document submitted to and approved by a graduate faculty committee as evidence of mastery of research in landscape architecture.

## Latin (LATIN)

***Any experimental courses offered by LATIN can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****LATIN 101: Elementary Latin I**

(3-0) Cr. 3. F.

Grammar and vocabulary of classical Latin, within the context of Roman culture; reading knowledge through texts adapted from classical authors.

**LATIN 102: Elementary Latin II**

(3-0) Cr. 3. S.

*Prereq: LATIN 101*

Grammar and vocabulary of classical Latin, within the context of Roman culture; reading knowledge through texts adapted from classical authors. Meets International Perspectives Requirement.

**LATIN 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in LATIN; Permission of Department Chair*

Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 9 credits in Latin 490 may be counted toward graduation.

## Leadership Studies (LD ST)

***Any experimental courses offered by LD ST can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****LD ST 122: Leading with Purpose**

(1-0) Cr. 1. F.S.

Designed for emerging student leaders. Basic leadership skills covering personal skills development, goal achievement, values-based behaviors and mission statement development.

**LD ST 270: Campus Leadership Development**

(3-0) Cr. 3. F.S.SS.

Introduce effective leadership practices for emerging leaders. Engage in experiential campus leadership opportunities.

**LD ST 290: Independent Study**

Cr. 1-3. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in leadership studies. No more than 6 credits of LD ST 290 or LD ST 490 may count toward graduation.

**LD ST 291: Leading Change**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

Understand leading change and analyzing social issues through meaningful experiential learning.

**LD ST 291A: Leading Change: General**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

Understand leading change and analyzing social issues through meaningful experiential learning.

**LD ST 291B: Leading Change: U.S. Diversity**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

Understand leading change and analyzing social issues through meaningful experiential learning with a U.S. Diversity focus.

**LD ST 291C: Leading Change: International Perspectives**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

Understand leading change and analyzing social issues through meaningful experiential learning with an international perspectives focus. Meets International Perspectives Requirement.

**LD ST 293: Special Projects**

Cr. 1-3. F.S.SS.

*Prereq: Permission of Instructor*

Special projects for the Leadership Studies Program.

**LD ST 301: Leadership Theory and Practice**

Cr. 3. F.S.SS.

Critical examination of historical and contemporary leadership theory. Apply leadership theory to practice.

**LD ST 322: Leadership in a Diverse Society**

(3-0) Cr. 3. F.S.SS.

Experiential opportunity to understand, develop, and apply diversity-informed leadership practices.

Meets U.S. Diversity Requirement

**LD ST 333: Women, Gender, and Leadership**

(Cross-listed with WGS). (3-0) Cr. 3.

*Prereq: Sophomore classification*

An intersectional approach to understanding gender and leadership as it relates to women from various races, ethnicities, gender identities, sexual orientations and abilities.

Meets U.S. Diversity Requirement

**LD ST 360: Cultural Competency and Global Leadership**

Cr. 3. Alt. F., offered irregularly.S.SS.

Development of an intercultural mindset and leadership practice in international contexts. An analysis and development of global leadership capacities.

Meets International Perspectives Requirement.

**LD ST 370: Special Topics**

Cr. 1-3. Repeatable, maximum of 6 credits. Alt. F., offered irregularly.Alt. S., offered irregularly.

Seminar on special topics, research, or theory in leadership studies.

Students must register for a different topic each time.

**LD ST 422: Leadership Capstone Seminar: Theory to Practice**

(3-0) Cr. 3. S.

*Prereq: LD ST 301 or LD ST 322 or Permission of Instructor*

Analysis of adaptive leadership theory to inform practice, with emphasis on ethical leadership and creating change.

**LD ST 488: Research on Gender and Leadership**

(Cross-listed with WGS). (3-0) Cr. 3.

Research on gender and leadership in selected content areas (e.g., business, education, politics and public service, and popular culture).

Following an overview of quantitative and qualitative methods and critical analyses of journal articles on gender and leadership, students work individually or in groups in selected content areas to write and present papers.

**LD ST 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent study in leadership studies. No more than 6 credits of LD ST 290 or LD ST 490 may count toward graduation.

## Learning and Leadership Sciences (L L S)

**Any experimental courses offered by L L S can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**L L S 112: Foundations of Learning and Productive Team Membership**  
(2-0) Cr. 2. F.

Introduction to developing intentional learners and worthy team members. Learning as the foundation of human enterprise; intellectual curiosity; ethics as a personal responsibility; everyday leadership; effective team and community interactions including team learning and the effects on individuals; and growth through understanding self, demonstrating ownership of own learning, and internalizing commitment to helping others. Intentional mental processing as a means of enhancing learning. Interconnectedness of the individual, the community, and the world.

**L L S 114: Developing Responsible Learners and Effective Leaders**  
(2-0) Cr. 2. S.

*Prereq: Credit or concurrent enrollment in L L S 112*

Focus on team and community. Application of fundamentals of human learning; evidence of development as a responsible learner; intentional mental processing as a habit of mind; planning and facilitating learning opportunities for others; responsibility of the individual to the community and the world; leading from within; holding self and others accountable for growth and development as learners and leaders.

**L L S 212: Habits of Mind and Decision-Making in Leadership**  
(2-0) Cr. 2. F.

*Prereq: Credit or concurrent enrollment in L L S 114*

Application of theories about habits of mind, mindset, and critical thinking to structured cross-disciplinary problem-solving scenarios. Development and utilization of personal and team action plans for specific habits of mind associated with leadership.

**L L S 312: Problem Solving and Action Planning in Leadership**  
(3-0) Cr. 3. S.

*Prereq: Credit or concurrent enrollment in L L S 212*

Transfer of theories about learning and leadership to practice. Leading for change. Using knowledge of self and interactive skills to explore interdependence. Development of an action plan that addresses a real-world problem.

**L L S 412: Learning and Leadership in Practice**  
(0-9) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in L L S 312*

Teamwork in a practicum to execute a project that will positively change the community. Application of learning and leadership theory: framing a problem, justifying approaches, taking action, getting feedback, and planning new actions. Application to be accompanied by continual reflection and feedback. Development of final portfolio to showcase cumulative leadership growth in the Learning and Leadership Sciences minor.

## Liberal Arts and Sciences Cross-Disciplinary Studies (LAS)

***Any experimental courses offered by LAS can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**LAS 101: Orientation for Open Option and Preprofessional Students**  
(1-0) Cr. 1. F.

Introduction to all undergraduate colleges. Provides information about university resources and services, assists with a successful academic transition to the university, and helps initiate the process of identifying academic major(s) and eventual career paths. Required of all first-year students in Open Option and Preprofessional Programs. Offered on a satisfactory-fail basis only.

**LAS 103: Frontiers of the Discipline**  
(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 103A: Frontiers of the Discipline: General**  
(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 103B: Frontiers of the Discipline: Humanities**  
(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 103C: Frontiers of the Discipline: Communication**  
(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 103D: Frontiers of the Discipline: Mathematics and Natural Sciences**

(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 103E: Frontiers of the Discipline: Social Sciences**

(1-0) Cr. 1. Repeatable.

Learning Community/ Seminar focusing entirely on the "cutting edge" research activities of faculty members. Offered on a satisfactory-fail basis only. A maximum of three total credits of LAS 103A, 103B, 103C, 103D, 103E can count for graduation.

**LAS 105: BOLD Learning Community Orientation**

(1-0) Cr. 1. F.

*Prereq: Member of the BOLD Learning Community.*

Orientation to the university for the "Bridging Opportunities in Leadership and Diversity" (BOLD) Learning Community students. Support for academic, social, and leadership development. Opportunity to connect with campus and college resources, explore career opportunities and build group identity. Includes regular one to one peer mentoring with multicultural student leaders. Offered on a satisfactory-fail basis only.

**LAS 106: BOLD Learning Community Seminar**

(1-0) Cr. 1. S.

*Prereq: Member of the BOLD Learning Community.*

Continued exploration of university services, academic, social, and leadership development for BOLD Learning Community students. Individual and group identity development. Includes regular one-on-one peer mentoring with multicultural student leaders and an assessed service-learning component. Offered on a satisfactory-fail basis only.

**LAS 125: Connections**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 125A: Connections: General**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 125B: Connections: Humanities**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 125C: Connections: Communication**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 125D: Connections: Mathematics and Natural Sciences**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 125E: Connections: Social Sciences**

(1-0) Cr. 1.

*Prereq: Freshman classification*

Links a large lecture class with a small learning community / seminar. In each case the professor teaching the large lecture facilitates a small weekly seminar. Informal discussions about critical issues of the day connected to lecture topics through films, public lectures and other events which students and the faculty leader attend. Offered on a satisfactory-fail basis only.

**LAS 151: Dean's Leadership Seminar I**

(1-0) Cr. 1. F.

*Prereq: College Permission*

Beginning to study leadership through applied examples, including the importance of community, communication, trust, shared responsibility, modeling the way, and inspiring a shared vision. Students will be introduced to campus leadership opportunities. Selection based on application.

**LAS 203: Professional Career Preparation**

(1-0) Cr. 1. F.S.SS.

*Prereq: Sophomore or higher classification*

Overview of practical skills such as writing resumes and cover letters, implementing an internship or job search, interviewing, evaluating offers, professional etiquette, and networking. Exploration of resources and online professional tools. Offered on a satisfactory-fail basis only.

**LAS 240: Pre-Law Seminar**

(1-0) Cr. 1.

Preparation for law school and careers in law. Introduction to the culture of law school, law school application process and admission criteria, strategies for Law School Admissions Test preparation, and how to finance a legal education. Offered on a satisfactory-fail basis only.

**LAS 245: STEM Scholars Seminar**

(1-0) Cr. 1. F.S.

Introduction to the culture of science at a research university. Concepts and strategies supporting success in science courses and in career pathways in science. Offered on a satisfactory-fail basis only.

**LAS 290: Independent Study**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Independent work as appropriate to the student's degree program. Academic work under faculty supervision may include written projects, presentations, reports, and guided readings.

**LAS 291: Service Learning**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with instruction and reflection. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 291A: Service Learning: General**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with instruction and reflection. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 291B: Service Learning: U.S. Diversity Project**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with instruction and reflection with a US Diversity focus. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 291C: Service Learning: International Perspectives Project**

Cr. 1-4. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with instruction and reflection with an International Perspectives focus. Academic work may include written projects, presentations, reports, and guided readings. Meets International Perspectives Requirement.

**LAS 293: Special Projects**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Special projects work supervised by the College of Liberal Arts and Sciences. Offered on a satisfactory-fail basis only. Offered on a satisfactory-fail basis only.

**LAS 293A: Special Projects: LAS Ambassadors**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Offered on a satisfactory-fail basis only.

**LAS 293B: Special Projects: Advising Project**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Offered on a satisfactory-fail basis only.

**LAS 293C: Special Projects: Career Services**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Special Project supervised by LAS Career Services. Offered on a satisfactory-fail basis only.

**LAS 293D: Special Projects: General**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: College Permission*

Special project supervised by the College of Liberal Arts and Sciences. Offered on a satisfactory-fail basis only.



**LAS 298: Internship/Co-op**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Liberal Arts and Sciences major; Freshman or Sophomore classification; Permission of Liberal Arts and Sciences Career Services*

Students participating in an internship or co-op on a full-time or part-time basis must register for this course prior to beginning their work experience to remain in student status. Offered on a satisfactory-fail basis only.

**LAS 345: Innovation and Entrepreneurship I**

(1-0) Cr. 1. F.

*Prereq: College Permission*

Introduction to the entrepreneurial mindset and key concepts related to innovation and entrepreneurship. Application of principles through case studies, group work and direct mentoring. Opportunities for experiential learning with LAS mentors, entrepreneurs, and alumni.

**LAS 346: Innovation and Entrepreneurship II**

(1-0) Cr. 1. S.

*Prereq: LAS 345; College Permission*

Exploration of key concepts related to innovation and entrepreneurship. Application of principles through case studies, group work and direct mentoring. Opportunities for experiential learning with LAS mentors, entrepreneurs, and alumni.

**LAS 350: Topics in Interdisciplinary Studies**

(3-0) Cr. 1-4. Repeatable, maximum of 8 credits.

**LAS 350A: Topics in Interdisciplinary Studies: Interdisciplinary**

(3-0) Cr. 1-4. Repeatable, maximum of 8 credits.

**LAS 350B: Topics in Interdisciplinary Studies: Humanities**

(3-0) Cr. 1-4. Repeatable, maximum of 8 credits.

**LAS 350C: Topics in Interdisciplinary Studies: Mathematics and Natural Science**

(3-0) Cr. 1-4. Repeatable, maximum of 8 credits.

**LAS 350D: Topics in Interdisciplinary Studies: Social Sciences**

(3-0) Cr. 1-4. Repeatable, maximum of 8 credits.

**LAS 399: Undergraduate Research**

Cr. R. Repeatable. F.S.SS.

*Prereq: College Permission*

Supervised research.

**LAS 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: College Permission*

Independent work as appropriate to the student's degree program. Academic work under supervision; may include written projects, presentations, reports, and guided readings. No more than 9 credits of LAS 490 may be applied toward graduation.

**LAS 490A: Independent Study: General**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: College Permission*

Independent work as appropriate to the student's degree program. Academic work under supervision; may include written projects, presentations, reports, and guided readings. No more than 9 credits of LAS 490 may be applied toward graduation.

**LAS 490E: Independent Study: Entrepreneurship**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: College Permission*

Independent work as appropriate to the student's degree program. Academic work under supervision; may include written projects, presentations, reports, and guided readings. This section intended for students in the Entrepreneurship Minor. No more than 9 credits of LAS 490 may be applied toward graduation.

**LAS 491: Advanced Service Learning**

Cr. 1-4. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with advanced instruction and reflection. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 491A: Advanced Service Learning: General**

Cr. 1-4. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with advanced instruction and reflection. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 491B: Advanced Service Learning: U.S. Diversity Project**

Cr. 1-4. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with advanced instruction and reflection with a U.S. Diversity focus. Academic work may include written projects, presentations, reports, and guided readings.

**LAS 491C: Advanced Service Learning: International Perspectives Project**

Cr. 1-4. F.S.SS.

*Prereq: College Permission*

Integration of meaningful service work with advanced instruction and reflection with an International Perspectives focus. Academic work may include written projects, presentations, reports, and guided readings. Meets International Perspectives Requirement.

**LAS 498: Internship/Co-op**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Liberal Arts and Sciences major; Freshmen or Sophomore*

*classification; Permission of Liberal Arts and Sciences Career Services*

Students participating in an internship or co-op on a full-time or part-time basis must register for this course prior to beginning their work experience to remain in student status. Offered on a satisfactory-fail basis only.

**LAS 499: Internship**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Liberal Arts and Sciences major; Freshmen or Sophomore*

*classification; Permission of Liberal Arts and Sciences Career Services*

Semester-long internship appropriate to the student's degree program.

Must include an academic component under faculty supervision such as written projects, reports, and guided reading. Students must register for this course prior to beginning their internship.

## Library (LIB)

**Courses primarily for undergraduates:**

**LIB 160: Introduction to College Level Research**

(1-0) Cr. 1. F.S.SS.

*Prereq: Completion of ENGL 101 requirement*

Eight-week course required for undergraduate degree. Provides a foundation for college level research. Students will develop the critical thinking skills necessary to successfully navigate the research process: developing a research question, searching strategically, evaluating sources, and using information ethically. To be taken as early as possible in the student's undergraduate career. See course descriptions of ENGL 150 and ENGL 250 for requirements related to LIB 160. Offered on a satisfactory-fail basis only.

## Linguistics (LING)

***Any experimental courses offered by LING can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**LING 101: Introduction to the Study of Linguistics**

(1-0) Cr. 1. S.

Cross-disciplinary perspectives on the study of linguistics. Applications of linguistics to real world problems. Careers in linguistics.

**LING 119: Introduction to World Languages**

(Cross-listed with WLC). (3-0) Cr. 3.

Study of language diversity and the personal, social and political effects of diversity. Language families, attitudes toward language and language use, language and culture, multilingualism, foreign language learning, written codes, official languages, and language policy.

Meets International Perspectives Requirement.

**LING 120: Computers and Language**

(Cross-listed with ENGL). (3-0) Cr. 3.

Introduction to the use of linguistic knowledge in computer applications today and the basic computational techniques used in such applications. The development of these techniques throughout the history of computational linguistics. How the study of language has contributed to the advancement of technology and how certain computational problems have influenced the way linguists study language.

**LING 207: Introduction to Symbolic Logic**

(Cross-listed with PHIL). (3-0) Cr. 3. F.S.

Introduction to fundamental logical concepts and logical symbolism.

Development of natural deduction through first order predicate logic with identity. Applications to arguments in ordinary English and to philosophical issues. Linguistics majors should take LING/PHIL 207 as early as possible.

**LING 219: Introduction to Linguistics**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Introduction to linguistic concepts and principles of linguistic analysis with English as the primary source of data. Sound and writing systems, sentence structure, vocabulary, and meaning. Issues in the study of usage, regional and social dialects, language acquisition, and language change.

**LING 220: Descriptive English Grammar**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

Overview of grammatical structures and functions. Parts of speech; phrase, clause, and sentence structure; sentence types and sentence analysis; rhetorical grammar and sentence style; terminology. Not a remedial, English composition, or ESL course.

**LING 309: Introduction to Culture and Language**

(Cross-listed with ANTHR). (3-0) Cr. 3.

Introduction to study of language, culture and society from an anthropological perspective. Focus on language and thought, ethnography of speaking, discourse and narrative, writing and literacy, and media communication. Discussion of key theories and methods of linguistic anthropology. ANTHR 201 recommended.

Meets International Perspectives Requirement.

**LING 318: Introduction to ESL methods and materials**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: ENGL 219 or LING 219*

Introduction to methods and materials for teaching English as a Second Language (ESL) for elementary and secondary students. Strategies and resources for teaching reading, writing, speaking and listening skills. Elementary Education students must take this course in the same semester as either EDUC 280S or EDUC 480S.

**LING 319: Studies in Language and Diversity**

(Cross-listed with ENGL). Cr. 3. Repeatable, maximum of 9 credits. F.

*Prereq: ENGL 250*

Special topics related to the role of language and linguistics in US diversity, such as Dialects and American literature, American English Accents, Legal and Social Aspects of English-only Laws in the US. Connections between language use and social diversity.

**LING 320: Topics in Linguistic Structure**

(Cross-listed with ENGL). Cr. 3. Repeatable, maximum of 9 credits. S.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220)*

Special topics related to the study of linguistic structure. Focus on language structure in areas not covered in detail by existing courses. Topics include field linguistics, morphology, forensic linguistics, neurolinguistics, semantics, non-English phonology, acoustic phonetics, linguistic universals, and historical linguistics.

**LING 322: Language and Society**

(Cross-listed with ENGL). Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

Introduction to variation in language use in society. Survey of factors affecting language use, including background characteristics of language users, location, and purpose of interaction in addition to institutional, state, and national language policies.

**LING 324: Introduction to Teaching ESL Literacy**

(Cross-listed with ENGL). Cr. 3. F.

*Prereq: ENGL 219 or LING 219*

Introduction to the issues and methods involved in teaching literacy skills to English as a second language (ESL) learners. The nature of literacy and materials and methods for developing ESL literacy at the middle school, high school, and adult ages across multiple levels of competency.

**LING 325: Teaching Methods for ESL Learners: Oral Communication Skills**

(Cross-listed with ENGL). Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

Issues and methods in teaching oral communication skills (listening, speaking, pronunciation) to English as a second language (ESL) learners. The nature of oral language ability. Materials and Methods for developing oral communication skills at middle school, high school, and adult contexts.

**LING 331: Theory of Computing**

(Cross-listed with COM S). (3-1) Cr. 3. F.S.

*Prereq: Minimum of C- in (COM S 228; MATH 166; ENGL 250); (COM S 230 or CPR E 310)*

Models of computation: finite state automata, pushdown automata and Turing machines. Study of grammars and their relation to automata. Limits of digital computation, unsolvability and Church-Turing thesis. Relations between classes of languages.

**LING 351: Introduction to Spanish-English Translation**

(Cross-listed with SPAN, US LS). (3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or SPAN 303B or SPAN 304*

Introduction to the theory, methods, techniques, and problems of translation. Consideration of material from business, literature, and the social sciences. Taught in Spanish. Meets International Perspectives Requirement.

**LING 352: Spanish Pronunciation**

(Cross-listed with SPAN). (3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or SPAN 303B or SPAN 304*

An introductory study of the articulation, classification, distribution, and regional variations of the sounds of the Spanish language. Taught in Spanish. Meets International Perspectives Requirement.

**LING 354: Introduction to Spanish-English Interpretation**

(Dual-listed with LING 554). (Cross-listed with SPAN). (3-0) Cr. 3. F.S.

*Prereq: SPAN 351*

Introduction to the theory, methods, techniques, and problems of consecutive and simultaneous interpretation. Consideration of material from business, agriculture, law, design, medicine, literature, advertisement, and sports. Taught in Spanish. Meets International Perspectives Requirement.

**LING 371: Phonetics and Phonology**

(3-0) Cr. 3.

*Prereq: ENGL 219*

Terminology, theory, research, and applications of the science of the sounds of spoken language. Emphasis on American English and International Phonetic Alphabet.

**LING 395: Study Abroad**

Cr. 3. Repeatable, maximum of 2 times.

Instruction in issues of language policy, practice and learning.

Observation and experience with language use outside of the United States.

Meets International Perspectives Requirement.

**LING 410: Language as Data**

(Cross-listed with ENGL). Cr. 3. S.

*Prereq: Junior classification*

Methods of discovering language patterns in text documents solve practical text analysis problems in the disciplines. Fundamentals of linguistics and its role in text analysis. Practice writing R scripts to perform text analysis and visualize textual data.

**LING 413: Psychology of Language**

(Cross-listed with PSYCH). (3-0) Cr. 3.

*Prereq: PSYCH 101*

Introduction to psycholinguistics. Topics may include origin of language, speech perception, language comprehension, reading, bilingualism, brain bases of language, and computational modeling of language processes.

**LING 420: History of the English Language**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220)*

Comparison of English to other languages by family background and by type. Analysis of representative Old, Middle, Early Modern and present-day English texts, including both literary works and non-literary documents.

**LING 422: Women, Men, and the English Language**

(Cross-listed with ENGL, WGS). (3-0) Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

The ways men and women differ in using language in varied settings and the ways in which language both creates and reflects gender divisions.

**LING 425: Second Language Learning and Teaching**

(Cross-listed with ENGL). (3-0) Cr. 3. S.

*Prereq: (ENGL 219 or LING 219); Junior classification*

The process of second language learning and principles and techniques of teaching second languages. Learning and teaching in specific situations and for particular purposes. Current applications of technology in teaching and assessment.

**LING 437: Grammatical Analysis**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: (ENGL 219 or LING 219); (ENGL 220 or LING 220); Junior classification*

Theories and methods for analysis of syntax and morphology.

**LING 462: Contrastive Analysis of Spanish/ English for Translators**

(Cross-listed with SPAN). (3-0) Cr. 3.

*Prereq: SPAN 351*

Linguistic study of the major differences between the Spanish and English grammatical systems and their applications in the translation of Spanish to English. Taught in Spanish.

**LING 463: Contemporary Spanish Linguistics**

(Dual-listed with LING 563). (Cross-listed with SPAN). (3-0) Cr. 3.

Repeatable, maximum of 6 credits.

*Prereq: SPAN 352*

Study of various topics related to the Spanish language. Topics may include bilingualism, historical linguistics and dialectology, Spanish in the U.S., language assessment, computer-assisted language learning and instruction, and second language acquisition. Taught in Spanish. Meets International Perspectives Requirement.

**LING 471: Language and Reading Development in Children**

(3-0) Cr. 3.

*Prereq: ENGL 219 or LING 219 or PSYCH 230*

Development of spoken language, reading and writing covering semantics, syntax, morphology, phonology, and pragmatics.

**LING 486: Methods in Elementary School World Language Instruction**

(Cross-listed with EDUC, WLC). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language*

Planning, implementation, and assessment of standards-based, student-centered, and thematic instruction in the elementary (K-8) classroom. Special emphasis on K-8 students' communicative skills, cultural knowledge, and content learning.

**LING 487: Methods in Secondary School World Language Instruction**

(Cross-listed with EDUC, WLC). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language; Department Permission*

Theories and principles of contemporary world language learning and teaching. Special emphasis on designing instruction and assessments for active learning. Admission to teacher education required.

**LING 490B: Independent Study: Linguistics**

(Cross-listed with ENGL). Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 9 credits in English beyond ENGL 250; Junior classification;*

*Department Permission*

Designed to meet the needs of students who wish to study in areas other than those in which courses are offered. No more than 9 credits of ENGL 490 may be used toward graduation.

**LING 490D: Independent Study: Linguistic Anthropology**

(Cross-listed with ANTHR). Cr. 1-5. Repeatable, maximum of 9 credits.

*Prereq: 9 credits in ANTHR; Permission of Instructor*

No more than 9 credits of Anthr 490 may be counted toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**LING 510: Introduction to Computers in Applied Linguistics**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: Graduate classification*

Use of software and web applications for language teaching, linguistic analysis, and statistical analysis. Issues and problems in applied linguistics related to computer methods.

**LING 511: Introduction to Linguistic Analysis**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: Graduate classification*

Principles and methods of linguistic analysis with emphasis on phonology, morphology, and syntax. Description of linguistic variation and current theoretical approaches to linguistics.

**LING 512: Second Language Acquisition**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theory, methods, and results of second language acquisition research with emphasis on approaches relevant to second language teaching.

**LING 513: Language Assessment Practicum**

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.SS.

*Prereq: ENGL 519 or LING 519*

Advanced practicum in language assessment.

**LING 514: Sociolinguistics**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theories and methods of examining language in its social setting. Analysis of individual characteristics (e.g., age, gender, ethnicity, social class, region), interactional factors (e.g., situation, topic, purpose) and national policies affecting language use.

**LING 515: Statistical Natural Language Processing**

(Cross-listed with ENGL, HCI). (3-0) Cr. 3.

*Prereq: STAT 330 or equivalent, recommended ENGL 219 or LING 219, or ENGL 511 or LING 511*

Introduction to computational techniques involving human language and speech in applications such as information retrieval and extraction, automatic text categorization, word prediction, intelligent Web searching, spelling and grammar checking, speech recognition and synthesis, statistical machine translation, n-grams, POS-tagging, word-sense disambiguation, on-line lexicons and thesauri, markup languages, corpus analysis, and Python programming language.

**LING 516: Methods of Formal Linguistic Analysis**

(Cross-listed with ENGL). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 219/LING 219 or equivalent.*

Data and knowledge structures for formal representation of natural language and speech data. Designing and implementing algorithms for automating linguistic analysis tasks. Conceptual issues for natural language and speech processing programming.

**LING 517: Corpus Linguistics**

(Cross-listed with ENGL). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in Linguistics*

Corpus linguistics methods of language analysis, including corpus design, construction and annotation; data in corpus studies; tools and methods of analysis. Corpus methods applied in vocabulary, grammar, register and dialect variation, language change, pragmatics, semantics, stylistics, language learning and teaching, and language testing.

**LING 519: Second Language Assessment**

(Cross-listed with ENGL). (3-0) Cr. 3. S.

*Prereq: ENGL 511 or LING 511*

Principles of second language assessment including reliability, validity, authenticity and practicality. Constructing, scoring, interpreting, and evaluating second language tests for a variety of situations.

**LING 520: Computational Analysis of English**

(Cross-listed with ENGL, HCI). (3-0) Cr. 3.

*Prereq: ENGL 510 or LING 510, and ENGL 511 or LING 511*

Concepts and practices for analysis of English by computer with emphasis on the applications of computational analysis to problems in applied linguistics such as corpus analysis and recognition of learner language in computer-assisted learning and language assessment.

**LING 524: Literacy: Issues and Methods for Nonnative Speakers of English**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theoretical and practical issues and techniques in the teaching of literacy in a variety of contexts, involving children and adults at basic skill levels and teens and adults in academic and vocational programs.

**LING 525: Research and Teaching of Second Language Pronunciation**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Theoretical and practical issues and techniques in the teaching of second language pronunciation as it relates to other areas of language, especially listening and speaking skills. Topics will include segmental and suprasegmental features; intelligibility; pronunciation in language assessment; classroom, technology and individual instruction; and research issues. Topics will be relevant to those intending to teach or research in various contexts.



**LING 526: Technology for Language Learning**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or equivalent*

Theory, research, and practice in computer use for teaching nonnative speakers of English. Methods for planning and evaluating computer-based learning activities.

**LING 527: Discourse Analysis**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Methods and theoretical foundations for linguistic approaches to discourse analysis. Applications of discourse analysis to the study of texts in a variety of settings, including academic and research contexts.

**LING 528: English for Specific Purposes**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 511 or LING 511 or an introductory course in linguistics*

Issues and techniques in analyzing, teaching, and assessing English for specific purposes. Topics include theories of specific purpose language use, analysis of learner needs in target language contexts, and corpus-informed syllabus and materials development for teaching and assessment.

**LING 530: Technology and Oral Language**

(Cross-listed with ENGL). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENGL 219 or ENGL 511 or equivalent.*

Structure and description of oral language and discourse. How spoken language is linguistically described, analyzed, and taught for research and for education. Using technology to record, transcribe, and analyze spoken language at all levels of linguistic structure.

**LING 537: Corpus Approaches to Grammatical Analysis**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 220 or LING 220; ENGL 219, LING 219, ENGL 511, LING 511, or introductory course in linguistics; graduate classification*

Corpus-informed analysis of syntax in authentic writing and speech, with emphasis on approaches used in applied linguistics.

**LING 554: Introduction to Spanish-English Interpretation**

(Dual-listed with LING 354). (Cross-listed with SPAN). (3-0) Cr. 3. F.S.

*Prereq: SPAN 351*

Introduction to the theory, methods, techniques, and problems of consecutive and simultaneous interpretation. Consideration of material from business, agriculture, law, design, medicine, literature, advertisement, and sports. Taught in Spanish.

Meets International Perspectives Requirement.

**LING 563: Contemporary Spanish Linguistics**

(Dual-listed with LING 463). (Cross-listed with SPAN). (3-0) Cr. 3.

Repeatable, maximum of 6 credits.

*Prereq: SPAN 352*

Study of various topics related to the Spanish language. Topics may include bilingualism, historical linguistics and dialectology, Spanish in the U.S., language assessment, computer-assisted language learning and instruction, and second language acquisition. Taught in Spanish. Meets International Perspectives Requirement.

**LING 588: Supervised Practice Teaching in Teaching English as a Second Language**

(Cross-listed with ENGL). (1-5) Cr. 3. F.S.

*Prereq: 9 credits toward the TESL/TEFL Certificate or 15 credits toward the TESL/AL master's degree.*

Intensive observation of ESL instruction and supervised practice in teaching learners of English in a context appropriate to the student teacher's goals. ENGL 588 cannot be used for teacher licensure.

**LING 590: Special Topics**

(Cross-listed with ENGL). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**LING 590B: Special Topics: Teaching English as a Second Language (TESL)/Applied Linguistics**

(Cross-listed with ENGL). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**LING 590G: Special Topics: Applied Linguistics and Technology**

(Cross-listed with ENGL). Cr. arr. Repeatable.

*Prereq: Permission of the Director of Graduate Education according to guidelines available online*

**LING 591: Studies in Applied Linguistics**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in TESL/Applied Linguistics*

Intensive study of applied linguistic theory as it relates to specific issues in language acquisition, teaching, or use.

**LING 591B: Directed Readings: Teaching English as a Second Language (TESL)/Applied Linguistics**

(Cross-listed with ENGL). Cr. arr. Repeatable.

**LING 591G: Directed Readings: Applied Linguistics and Technology**

(Cross-listed with ENGL). Cr. arr. Repeatable.

**Courses for graduate students:**



**LING 623: Research Methods in Applied Linguistics**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable.

Survey of research methods used in applied linguistics. Focus on conceptualizing and conducting research studies, including the process of developing research questions, gathering data, choosing data collection measures, and coding and analyzing data. Examples from a range of research approaches in the journals in applied linguistics and related areas are evaluated. The course prepares students to be critical consumers of quantitative and qualitative applied linguistics research and able to design and carry out their own research studies.

**LING 623A: Research Methods in Applied Linguistics: Quantitative**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: ENGL 511 or LING 511*

Survey of quantitative research methods used in applied linguistics.

**LING 623B: Research Methods in Applied Linguistics: Qualitative**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 511 or LING 511*

Survey of qualitative research methods used in applied linguistics.

**LING 626: Computer-Assisted Language Testing**

(Cross-listed with ENGL). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: ENGL 510 or LING 510, ENGL 511 or LING 511, ENGL 519 or LING 519*

Principles and practice for the use and study of computers and the Internet in second language assessment.

**LING 630: Seminar in Applied Linguistics**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable.

*Prereq: ENGL 510 or LING 510, ENGL 511 or LING 511*

Topic changes each semester. Topics include advanced methods in natural language processing, technology and literacy in a global context, feedback in CALL programs, technology and pronunciation, and advances in language assessment.

## Management (MGMT)

*Any experimental courses offered by MGMT can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistics/](http://registrar.iastate.edu/faculty-staff/courses/explistics/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistics/>)

**Courses primarily for undergraduates:**

**MGMT 320: Corporate Entrepreneurship**

(Cross-listed with ENTSP). (3-0) Cr. 3. F.S.

*Prereq: sophomore classification*

Introduces entrepreneurial approaches aimed at the identification, development and exploitation of technical and organizational innovations, the management of new product or process developments, and the effective management of new ventures. Focuses on mid-size to large corporations, especially in the manufacturing and service industries. Develops an awareness and understanding of the range, scope, and complexity of issues related to the creation of a corporate environment that is supportive of entrepreneurial endeavors as well as the effective implementation of technological and organizational innovations in corporate settings.

**MGMT 370: Managing Organizations**

(3-0) Cr. 3. F.S.SS.

*Prereq: Sophomore Classification*

Introduction to management as a field and function within organizations. Provides an overview of what managers do in organizations, including how they deal with multiple stakeholders; make decisions about organizational goals, strategies, and structures that align with the external and internal environment; as well as how they lead and manage human resources effectively.

**MGMT 371: Organizational Behavior**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore classification*

Introduction to the attitudes and behaviors of individuals and groups in organizations, as well as their antecedents: e.g., individual characteristics, interpersonal processes, manager and leader influences, and organizational characteristics and practices. Builds awareness of one's own and others' characteristics, attitudes, behaviors, and interpersonal and decision-making skills to improve as an employee and a manager.

**MGMT 372: Ethical and Responsible Management**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore Classification*

Introduces the many aspects of ethical and responsible management in today's organization, including the ethical implications of business decision-making (and the implications of having multiple stakeholders); corporate social responsibility; ethical leadership and other leadership styles as they pertain to responsible management; and the role of corporate governance and ethical codes in developing and institutionalizing an ethical organization. Builds ethical decision-making strategies and awareness of one's own ethical leadership philosophy.

**MGMT 381: Managing Family Businesses**

(Cross-listed with ENTSP). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Introduction to the important role family businesses play in the domestic and global economies as well as the complex and unique challenges and opportunities encountered by such businesses and their family members and other employees. Explores best practices for successfully managing family businesses.

**MGMT 414: International Management**

(3-0) Cr. 3. F.S.

*Prereq: Sophomore Classification*

Explains complexities managers face when doing business in countries where political, legal, economic, and cultural systems are different and require making decisions about the change, innovation, or adaptation needed to successfully formulate strategies for entering and operating in international markets.

**MGMT 422: Negotiation and Conflict Resolution**

(3-0) Cr. 3.

*Prereq: MGMT 370 or MGMT 371*

Introduces the theory and practice of negotiation (i.e., the art and science of securing an agreement between two or more interdependent parties) in a variety of settings, especially those faced by managers and professionals in organizations. Focuses on understanding the behavior of individuals, groups and organizations in the context of competitive situations, and the underlying interdependent relationships and processes. Builds analytical skills needed to discover optimal solutions to problems and a broad array of negotiation skills needed in order for those solutions to be accepted and implemented.

**MGMT 470: Leadership and Change Management**

(3-0) Cr. 3. F.S.SS.

*Prereq: MGMT 370 or MGMT 371*

Focuses on the practical application of leadership skills required in today's evolving business environment, including the need to effectively manage change. Develops through multiple hands-on activities an understanding of how leaders are able to inspire and lead their peers, direct reports, as well as themselves, and how leaders can create a culture that supports and inspires change within an organization.

**MGMT 471: Introduction to Human Resource Management**

(3-0) Cr. 3. F.S.

*Prereq: MGMT 371; STAT 226; ENGL 250*

Introduces the field of human resource management (HRM) and its relevance to managers, employees, and organizational strategic goal achievement. Explains how HRM practices can be a source of competitive advantage for organizations and develops knowledge and skills in the functional areas of HRM, including job analysis, selection, recruitment, compensation, and training and development. Builds skills critical to HRM (and other) professionals, such as communication, feedback, and teamwork skills.

**MGMT 472: Diversity, Equity, and Inclusion in Organizations**

(3-0) Cr. 3. F.S.

*Prereq: Junior classification and BUSAD 203*

Introduces the important topics of diversity, equity, and inclusion in organizations. Focuses on understanding dimensions of diversity and the importance of inclusion; effectively managing legal, ethical, media, and marketing issues in this area; and managing organizational change initiatives in this area. Builds students' abilities to work within and lead diverse teams and organizations and develops critical thinking about one's identity and equality of opportunity in organizations.

Meets U.S. Diversity Requirement

**MGMT 473: Evidence-Based Decision Making in Human Resource Management**

(3-0) Cr. 3. F.

*Prereq: COM S 113, ENGL 250, STAT 226, MGMT 371*

Focuses on evidence-based analysis of short- and long-term consequences of specific talent management practices on the organization and on society as a whole. Introduces, and provides hands-on experience with, measurement and analytic techniques applicable to business professionals. Builds knowledge and skills to describe, diagnose and improve processes pertaining to planning, recruiting, selecting, training, and developing talent in an organization as well as compensating, retaining, and managing the performance and careers of a diverse and talented workforce.

**MGMT 474: Compensation and Benefits**

(3-0) Cr. 3. F.S.

*Prereq: MGMT 471*

Introduces the fundamental elements of employee compensation and benefits (including strategies, structures, and practices), within the larger context of total rewards. Discusses impact of compensation and benefits on employee recruitment, retention, and engagement, the employer/employee relationship, as well as individual, organizational and societal returns. Provides tools and a holistic understanding to competently assess, manage and negotiate compensation and benefits, not only as a management/human resource professional but also as an employee (in any phase of their own compensation lifecycle).

**MGMT 475: Employment Law for Human Resource Management**

(3-0) Cr. 3. F.S.

*Prereq: ACCT 215; MGMT 471*

Introduces fundamentals of U.S. employment law necessary for human resource management. Topics include sources of employment law, classification of workers, lawful hiring practices, liability arising from harassment and discrimination, worker's rights and duties, employment contract issues, and lawful termination of an employee. Builds knowledge and skills for effectively managing each of these areas.

**MGMT 476: Applied Projects in Human Resource Management**

(3-0) Cr. 3. SS.

*Prereq: MGMT 471 and MGMT 474 and MGMT 475*

Takes an experiential and holistic view to address human resource management (HRM) issues, especially in small and mid-sized companies. Project-based format includes partnering with local companies to understand, research, and propose evidence-based HRM solutions that support the organization's overall strategy and business needs. Requires consideration and application of multiple HRM perspectives including hiring, employee development and retention, performance management, compensation and benefits, legal considerations, etc. Emphasis on developing situation-specific solutions that integrate multiple HRM best practices.

**MGMT 478: Strategic Management**

(3-0) Cr. 3. F.S.SS.

*Prereq: Credit or enrollment in ACCT 285, FIN 301; MGMT 370 or MGMT 371; MKT 340, SCM 301, MIS 301, ENTSP 310 and senior classification*

Examines why some organizations perform better than others, with an emphasis on how taking a holistic view of the organization and environment can lead to sustained competitive advantage. Evaluates how capabilities in various organizational functions can help enable and determine organizational strategy, and considers how strategic choices affect expectations of various functional areas and their interdependence. Emphasis on case analysis and discussion to build student competencies in the areas of internal and external analysis, complex decision-making, and the formulation, implementation, and evaluation of strategies.

**MGMT 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: senior classification, permission of instructor*

**Courses primarily for graduate students, open to qualified undergraduates:**

**MGMT 502: Organizational Behavior**

(3-0) Cr. 3. F.

*Prereq: Enrollment in MBA program or departmental permission*

Understanding human behavior in organizations and the nature of sustainable organizations from a managerial perspective. Special emphasis is placed on how individual differences, such as perceptions, personality, and motivation, influence individual and group behavior in organizations and on how behavior can be influenced by job design, leadership, groups, and the structure of organizations.

**MGMT 503: Professional Responsibility in Business and Society**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or department permission, ACCT 501, FIN 501, MGMT 502, MKT 501*

Ethical and social responsibilities of top managers in corporations. Topics include stakeholder management, corporate social responsibilities, strategies for sustainable development, pursuit of societal and corporate goals, board and chief executive leadership roles, governance reform and ethics, and executive leadership style and values. The presentation of course concepts is facilitated by the use of cases, discussion scenarios, and ethical dilemmas.

**MGMT 504: Strategic Management**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or departmental permission, ACCT 501, FIN 501, MGMT 502, MKT 501*

Critical analysis of case studies in strategic management with an emphasis on integrative decision making. Strategy implementation in light of the global, legal, economic, cultural, and political contexts of business.

**MGMT 522: Negotiation and Conflict Resolution**

Cr. 3.

*Prereq: Enrollment in the MBA program or permission of instructor*

Theory and practice of negotiation in a variety of settings, while focusing on understanding the behavior of individuals, groups and organizations in the context of competitive situations. Team work and team building is integrated to better understand interdependent relationships and processes.

**MGMT 525: Evidence-Based Talent Management**

Cr. 3.

*Prereq: Enrolled in the MBA or other master's program in the Ivy College of Business*

Introduces talent management as integral to the ongoing success of any organization, with a focus on contemporary, evidence-based approaches to effectively managing talent. Highlights best practices related to the capture, integration, and utilization of employee data for making decisions about talent and talent management practices, and builds practical skills related to the identification and development of talent. Intended for current managers from any functional background.

**MGMT 530: Leadership and Conflict Resolution**

(3-0) Cr. 3.

*Prereq: Enrollment in the MRED or instructor permission.*

Introduction to the theory and practice of leadership and negotiation. Emphasis on the science of influencing and resolving conflict, and securing an agreement between two or more interdependent parties. Behavior of individuals, groups, and organizations in the context of demanding situations.

**MGMT 571: Seminar in Personnel and Human Resources Management**

(3-0) Cr. 3. S.

*Prereq: MGMT 371 or MGMT 502 or SOC 420*

Topics and issues in personnel management with a focus on the management of human resources in organizations. Current personnel practices, philosophies, and behavioral science research.

**MGMT 572: Personality and Management**

(3-0) Cr. 3.

*Prereq: Graduate standing or permission of instructor*

Personality and individual differences have significant implications for human resource management, organizational behavior and strategic management. Research has shown that these characteristics affect many core management topics including motivation, leadership, and decision making. Surveys the literature relating personality and individual differences to management and organizations. Students will complete a wide variety of personality assessments and get their results, and reflect on how personality and individual differences can be practically relevant in the modern work environment.

**MGMT 582: Corporate Governance and Top Management**

(Cross-listed with ACCT). (3-0) Cr. 3.

*Prereq: MGMT 503 or permission*

Duties, structure, and functioning of top management teams and corporate boards of directors. CEO/board tenure and succession planning, top management compensation, board committee composition, assessment of CEO and board performance, theories of corporate governance, management of the corporate strategic agenda, governance codes, international governance, and chairman/CEO duality. Case studies and contemporary issues discussed.

**MGMT 583: Formulating and Implementing Innovation Strategies**

(Cross-listed with ENTSP). (3-0) Cr. 3.

*Prereq: MGMT 504 or permission of instructor*

Key strategies, models, and tools to foster and drive organizational innovation. Analysis of industry dynamics, sources and types of innovations, timing of entry; formulation of innovation strategies; developing innovation portfolios and collaboration strategies, protecting innovation; implementing technological innovation strategy, including new product development and deployment strategy. Essential traits of innovative strategic leaders. Critical analysis and discussion of cases focused on entrepreneurship and innovation and project requiring hands-on practical application of course concepts.

**MGMT 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

For students wishing to do individual research in a particular area of management.

**Courses for graduate students:**

**MGMT 601: Philosophy of Science**

(3-0) Cr. 3.

*Prereq: enrollment in the PhD program*

This course provides a philosophical introduction to the theoretical and empirical development of scientific knowledge. It focuses on a variety of basic problems common to the social sciences: the nature of explanation, the structure of theories, forms of knowledge, scientific laws, nature of theory and ethics. The purpose of the course is to help doctoral students define a research context by addressing the purposes, assumptions and primary components of scientific inquiry.

**MGMT 602: Organizational Theory**

(3-0) Cr. 3.

*Prereq: enrollment in the PhD program*

This seminar involves the examination of the core theories and perspectives in organizational theory, as well as their applications and extensions. This material addresses the fundamental rationale for organizations in modern society, basic processes of organizing and organizational structure, a consideration of inter-organizational relationships and the external environment, and a variety of factors that help determine organizational effectiveness.

**MGMT 603: Strategic Management of Technology and Innovation**

(3-0) Cr. 3.

*Prereq: MGMT 601*

This course will offer a critical review of organizational decision making with respect to technology and innovation. Students will learn how technological change can alter the basis of competition; how competitive strategy drives technology investment decisions; how market-orientation should be the other backbone of technological innovation; and best practices of organizing and managing the new product development process to achieve strategic goals.

**MGMT 604: Seminar in Organizational Behavior**

(3-0) Cr. 3.

*Prereq: enrollment in the PhD program*

The purpose of this seminar is to introduce behavioral science literature relevant to the study of behavior in organizational settings. The course will focus on the individual's role within organizations and cover topics such as individual differences, motivation, leadership, decision-making. Learning, risk taking, interpersonal relations, etc. Both theoretical and empirical contributions will be examined, with emphasis on integration of diverse theoretical perspectives.

**MGMT 605: Seminar in Strategic Management**

(Cross-listed with ENTSP). Cr. 3. Alt. F., offered odd-numbered years.

Critical review of theory and research in the field of strategic management. Introduction to representative conceptual and empirical research. Review theories that provide the foundation for management research, and review current research in associate research streams. The review will cover fundamental questions in strategy.

**MGMT 606: Historical Foundations of Entrepreneurship Research**

(Cross-listed with ENTSP). Cr. 3.

*Prereq: Enrollment in the PhD Program*

Seminal readings, theoretical perspectives, and historical roots of Entrepreneurship research. A broad variety of core foundational theories, perspectives, and approaches are discussed.

**MGMT 607: Current Topics in Entrepreneurship Research**

(Cross-listed with ENTSP). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Enrollment in the doctoral program*

Current theoretical perspectives and methodological approaches in entrepreneurship research. Current entrepreneurship research is inherently interdisciplinary such that we will draw on insights from scholars across a range of disciplines.

**MGMT 608: Human Resources Management Theory & Research**

Cr. 3. S.

Advanced research seminar in human resources management. The scope and coverage of the seminar is designed to representatively reflect the important content areas in the field, and the major theoretical and empirical contributions in each area. The seminar will be decidedly research focused with discussions concentrating on critical reviews and evaluations of existing work, and the identification of potential directions for theory development and future research. Through reading assignments, weekly papers, and the development of a theoretical paper, students should gain an appreciation for the current status of theory and research, and begin to articulate major issues and challenges facing the field of human resources management.

**MGMT 609: Organizational Research Methods**

(Cross-listed with ENTSP). Cr. 3. F.

*Prereq: Enrollment in ENTSP or MGMT PH D program or permission of instructor.*

Solid methodological foundation that will prepare you to be a productive producer and educated consumer of scientific research in the field of Management, Entrepreneurship, and other related disciplines. Introduction to numerous concepts and techniques with relevance to your future scholarship in this domain. Conceptual underpinnings necessary to appreciate the strengths and limitations of various approaches used in these fields and the interplay between theoretical advancement and rigorous empirical investigation.

**MGMT 650: Research Practicum I**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a research manuscript to be submitted to a peer-reviewed academic journal. Students will work with a faculty mentor on a research project.

**MGMT 651: Research Practicum II**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a second research manuscript to be submitted to a peer-reviewed academic journal. Although students work under the supervision of a faculty mentor, the students will take independent responsibility for the research project.

**MGMT 699: Dissertation**

Cr. 1-12.

*Prereq: Graduate classification, permission of dissertation supervisor*  
Research.

## Management Information Systems (MIS)

*Any experimental courses offered by MIS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****MIS 207: Fundamentals of Programming for Business and Analytics**

(3-1) Cr. 3. F.S.SS.

*Prereq: MATH 150 or placement into MATH 140 or higher*

Introduction to programming (what it is and how it works) and problem-solving methods, emphasizing the basics of good programming techniques and style. Covers data types, control and data structures, functions, parameter passing, library functions, and object-oriented design to develop business and analytics applications.

**MIS 301: Management Information Systems**

(3-0) Cr. 3.

*Prereq: COM S 113*

The role of information technology in organizations. Overview of methodologies for design and development of systems including decision support systems, expert systems, data bases, end-user computing, etc. Computer applications relate concepts to practice. Lecture and laboratory work emphasizes the enabling role of IT in contemporary organizations.

**MIS 307: Intermediate Business Programming**

(3-0) Cr. 3.

*Prereq: MIS 207/COM S 207 or COM S 227; credit or enrollment in MIS 301*

Introduction to the concepts and use of data structures, file accesses and object oriented programming methodologies in contemporary business environments. Application development environments will be covered.

**MIS 310: Information Systems Analysis**

(3-0) Cr. 3.

*Prereq: credit or enrollment in MIS 301*

Critical analysis of business processes, data and process modeling, feasibility studies, CASE tools, and developing system design specifications.

**MIS 315: Business Data Streams and Issues**

(Cross-listed with ACCT). Cr. 3. Alt. F., offered even-numbered years. Alt. S., offered odd-numbered years. SS.

*Prereq: MIS 301, ACCT 284*

Identification of open data sources and other private data sources. Develop methods of data access, collection, and sharing; develop methods to validate and standardize data sources; develop methods to assess data worthiness (risk).

**MIS 320: Database Management Systems**

(3-0) Cr. 3.

*Prereq: Credit or enrollment in MIS 301*

Database design, development, and implementation. Focus on data models, both classical and object oriented. Uses relational and/or object oriented database management systems.

**MIS 340: Project Management**

(Cross-listed with SCM). (3-0) Cr. 3.

*Prereq: credit or enrollment in MIS 301*

Equips students to support team activities in the general project management environment and better manage their careers. Practical experience using project management techniques and tools. Course topics include project initiation and execution, risk assessment, estimating and contracts, planning, human factors, and standard methods.

**MIS 367: Consultative Problem Solving**

(Cross-listed with MKT). Cr. 3. F.S.

*Prereq: Sophomore and above*

Consultative problem-solving approach to address complex problems in marketing and related fields. Topics include problem definition, issue tree dis-aggregation, hypotheses development and the Pyramid Principle. Development of skills such as formulating problems, structuring and prioritizing problems, synthesizing results and communicating intuition from quantitative analyses.



**MIS 368: Marketing Analytics**

(Cross-listed with MKT). (3-0) Cr. 3. F.S.

*Prereq: MKT 340, STAT 226*

Use of different tools to conduct various analyses to support marketing strategies. Topics include data visualization and exploration, forecasting, social media analytics and other marketing techniques. Development of skills such as structuring problems, and synthesizing results from quantitative analyses.

**MIS 403: Healthcare Information Systems**

(Cross-listed with HCM). Cr. 3.

*Prereq: MIS 301; credit or concurrent enrollment in HCM 301*

Explores the critical role information technologies and systems play in healthcare organizations. The focus is on evaluating and implementing software and IT systems that facilitate delivery of health care; understanding information technology governance, data privacy, and security; planning and project management; and tracking future developments of information technology in healthcare management. Introduction to Electronic Health Records (EHR) and other Management and Financial Information System applications used by healthcare organizations.

**MIS 407: Advanced Business Programming**

(3-0) Cr. 3.

*Prereq: MIS 307*

Advanced software development and topics in contemporary programming languages. Topics include basic syntax, advanced programming techniques, file structures and management, database access, algorithm design, web forms and graphical user interfaces.

**MIS 435: Cybersecurity in Business**

(3-0) Cr. 3.

*Prereq: MIS 301*

Introduction to fundamental concepts in networking and cloud computing and related cybersecurity concepts. Examination of network and cloud architectures, technologies, management and governance, security controls and techniques used to design, deploy, and protect resources in those environments. Exposure to cybersecurity tools in hands-on labs and explore methods of implementing and maintaining effective networks and cybersecurity programs in private, public, and cloud infrastructures.

**MIS 436: Introduction to Business Analytics**

(3-0) Cr. 3.

*Prereq: MIS 320 or ACCT 384, AND Pre- or Co-requisite of STAT 326*

Introduction to the field of business analytics (BA). Students will examine BA processes and techniques used in transforming data to knowledge and creating value for organizations. Business cases, presentations by business professionals, class lectures and discussions on data analysis, design and modeling, and extensive hands-on analytical exercises.

**MIS 439: Topics in Management of Information Systems**

(3-0) Cr. 3. Repeatable.

*Prereq: MIS 301, permission of instructor*

A variety of topics will be covered and topics may vary between semesters. Some of the topics are information resources management, electronic commerce, decision support systems, and expert systems.

**MIS 440: Supply Chain Information Systems**

(Cross-listed with SCM). (3-0) Cr. 3.

*Prereq: MIS 301, SCM 301*

Internal and inter-organizational information systems necessary for a supply chain to achieve competitive advantage. Topics include: design, development, implementation, and maintenance of supply chain information systems; enterprise resource planning; advanced planning and scheduling, manufacturing execution systems; and the interface between manufacturing planning and control processes, logistics processes, and the information system.

**MIS 445: Enterprise Cybersecurity**

(3-0) Cr. 3.

*Prereq: MIS 301*

Introduction to the elements of a cybersecurity program in the administrative, technical, and physical security domains. Learn methods to analyze and assess organizational risk and determine appropriate controls, be exposed to offensive and defensive cybersecurity tools in hands-on labs, and explore methods of implementing and maintaining effective cybersecurity programs. Examination of policy, frameworks, laws, regulations, and compliance and how they influence and contribute to cybersecurity programs.

**MIS 446: Advanced Business Analytics**

(3-0) Cr. 3.

*Prereq: MIS 320 or ACCT 384, AND Pre- or Co-requisite of STAT 326*

Projects-based course which provides an in-depth understanding of BA methods of visualization, data mining, text mining, web-mining, and predictions through the use of specific BA tools. For students who are interested in understanding advanced techniques and applications of data analytics and acquiring hands-on skills for making intelligent business decisions in data-rich organizations.

**MIS 447: Information Systems Development**

(3-0) Cr. 3.

*Prereq: MIS 301 and MIS 310*

Design of business systems using contemporary tools and methods such as SQL, CASE tools, OOD tools, etc. Focuses on synthesizing concepts from earlier MIS courses.

**MIS 450: Enterprise Resource Planning Systems in Supply Chain**

(Cross-listed with SCM). (3-0) Cr. 3.

*Prereq: SCM 301, MIS 301 or I E 148, I E 341*

Examination of the role of enterprise resource planning systems (ERP) in the supply chain. Hands-on experience with a major software application in use by many corporations to manage and improve the efficiency of their supply chains and operations. Students will develop a more process-centric perspective about how a supply chain operates and how ERP enables and supports such operations.

**MIS 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: MIS 301, senior classification, permission of instructor***MIS 495: Executive Presentation and Analysis**

(3-0) Cr. 3. Repeatable. F.S.

*Prereq: MIS 301*

Students explore different practical scenarios related information systems projects and cases. Students acquire necessary skills and knowledge to solve practical issues associated with presented cases and problems. Students compete at different venues around the country. Only 3 credits of MIS 495 may count as a MIS major or minor choice elective.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MIS 501: Management Information Systems**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Current theories and practices appropriate for understanding the role and application of information systems for individuals, organizations, and society within a globally competitive context. Focus on information technology and its uses in improving work practices, products, and tools for individuals and organizations. Issues pertaining to current and emerging topics in the development and use of technology, the role of technology in and its alignment with organizational strategy and sustainable business practices, information system planning and the development of enterprise architectures, and human interface and personal characteristics in the design and use of technology.

**MIS 515: Big Data for Business**

Cr. 3. F.

*Prereq: Graduate classification or instructor permission.*

Understanding the issues and challenges of data from multiple sources, different velocities, in large volumes with questionable veracity.

**MIS 532: Programming Foundations for Business Analytics**

(3-0) Cr. 3. SS.

*Prereq: Graduate classification or instructor permission.*

Explores the application of structured programming techniques for business analytics. Topics include data collection, processing, analysis, and more. Focus is on individual and group activities that reinforce skills development and provide the basis for later advanced work in data modeling.

**MIS 533: Data Management for Decision Makers**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Addresses data needs of functions such as marketing, finance, and production. Advanced skills needed to design, develop and use database, data warehousing and data mining systems for effective decision support. Emphasis on importance of contemporary technologies.

**MIS 535: Networks and Information Security Management**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Issues involved in the management of telecommunications function. Overview of communications technology used in various business applications, local area network, wide area network, broad band network, wireless and voice networks. Internet technologies and protocols. Analyzing the strategic impact of these technologies on organizations. Strategic planning for telecommunications, including network planning and analysis.

**MIS 536: Business Analytics Foundation**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Introduction to Business Analytics (BA) concepts and tools. Hands-on lab exercises and business case studies in data preparation, data querying and data visualization. Also covers various modeling techniques in predictive and prescriptive analytics.

**MIS 537: Project Management**

(3-0) Cr. 3.

*Prereq: Graduate classification or instructor permission.*

Prepares students to support team activities in the general project management environment and provides them with a working understanding of the full scope of project management activities. Students will also have practical experience using project management techniques and tools. Course topics include project initiation and execution, risk assessment, estimating and contracts, planning, human factors, and standard methods. The course follows the recommended content areas of the Project Management Institute, and provides students with a recognized foundational training in project management.

**MIS 538: Business Process Systems**

(3-0) Cr. 3.

*Prereq: MIS 501 and graduate classification or instructor permission*

Examine current and historical perspectives on business process management. Topics include process identification, mapping, and improvement. Additional topics will address business process automation and integration, business process outsourcing. Investigate current and potential tools and methods for business process management. Include process management projects.

**MIS 539: Topics in Management of Information Systems**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or instructor permission.*

A variety of topics may be offered in different semesters. Topics may include electronic commerce, information resources management, decision support systems, and expert systems.

**MIS 541: Analytics in Finance**

(Cross-listed with FIN). Cr. 3. S.

*Prereq: BUSAD 502 or an advanced undergraduate statistics course recommended*

Introduction to Business Analytics (BA) in finance and the insurance industry. The concepts and tools discussed in this course, to be followed and complemented by more advanced courses in the area. Basic analytical thinking and business acumen focusing on applications from finance and insurance. Practical data analytic skills based on building real analytic applications on real data.

**MIS 544: Social Media Business Applications and Analytics**

Cr. 3. SS.

*Prereq: MIS 536*

The role of new collaborative social technologies and analysis of social media data. Exploration of strategic and operational applications of social media and of tools that support the analysis of social network and social media data. Application of text analysis and social network theory.

**MIS 545: Enterprise Cybersecurity Management**

Cr. 3. F.S.

*Prereq: Graduate classification or instructor permission.*

Challenges, technologies, and practices of information security management in enterprise operations.

**MIS 546: Advanced Business Analytics**

(3-0) Cr. 3. F.S.

*Prereq: MIS 536*

An in-depth discussion of various advanced topics in Business Analytics (BA) such as Big Data Analytics, Text Analytics, and Web Analytics. Extensive hands-on exercises of using BA tools to solve real-world problems. Preparation for students' capstone projects.

**MIS 547: Teams, Projects, and Analytics Leadership**

Cr. 3. SS.

*Prereq: Graduate classification or instructor permission.*

Provides business analytics students with an intensive preparation in teamwork and project management skills necessary to prosper in the program and carry forward into their professional lives. Topics include project management, team management, in class exercises, and case studies. Practical experience using project management techniques and tools.

**MIS 548: Applications of Machine Learning for Business Intelligence**

Cr. 3. F.

*Prereq: Graduate classification or instructor permission.*

Introduction to applications for data science concepts in the business domain. As big data, machine learning, business analytics, business intelligence and other concepts grow in business applications, it is essential for students to understand the underlying concepts, data, models, and applications to be successful in a data-driven world. Learn to determine problem types, data restrictions, model selection, tool choice, and analysis of data science concepts for greater business value.

**MIS 551: IT Strategy & Execution**

Cr. 3. F.

*Prereq: Graduate classification or instructor permission.*

Explore the building blocks of IT strategy in alignment with the business strategy. Emphasis on business aspects. Evaluate the impact of technologies on IT strategy. Explore IT strategy framework, understand the latest trends and exercise critical thinking with relevant case studies and discussion. Small groups will analyze a fictitious company as assigned and develop a future state IT vision and IT strategy that supports the business goals. Guest lecturers.

**MIS 556: Business Analytics Capstone Project**

Cr. 3. S.

*Prereq: MIS 547*

Synthesize analytics concepts, skills, and practices learned during the program of study to complete a course project. Projects proposals relevant to a firm are proposed and accepted midway through the program. Student cohort teams will complete the capstone project under the supervision of an advisory team of faculty. At the completion of the course teams will present their project marking the completion of the program of study. Offered on a satisfactory-fail basis only.

**MIS 568: Marketing Analytics**

(Cross-listed with MKT). Cr. 3. F.S.

*Prereq: Graduate Classification or Instructor Permission and must have knowledge of R or Python*

Integration of various concepts to solve problems using appropriate tools. Specifically, the course consist of the following three components: (a) help students develop consultative problem-solving skills; (b) introduce various newly developed consumer behavior theories; (c) provide an overview of quantitative models in the field of marketing analytics. Hands-on experiences to enhance skills such as formulating problems, structuring and prioritizing problems, synthesizing results and communicating intuition from complicated analyses.

**MIS 590: Special Topics**

Cr. 1-3. Repeatable, maximum of 3 credits.

*Prereq: Graduate classification or instructor permission.*

For students wishing to do individual research in a particular area of MIS.

**MIS 598: Research Seminar in Management Information Systems**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Examines issues such as the nature and content of information systems research; aspects of starting and pursuing research topics in information systems; exploring and understanding relevant research methods and tools. Develop preliminary research proposals.

**MIS 599: Creative Component**

Cr. 3.

*Prereq: Graduate classification, permission of supervisory committee chair*  
Preparation and writing of creative component.

**Courses for graduate students:****MIS 601: Introduction to Information Systems Research I**

(3-0) Cr. 3.

*Prereq: MIS 501 or equivalent, enrollment in PhD program*

The state of behavioral research in the IS function. MIS activities in an organization span the following three major areas: design and implementation of the MIS, use of the MIS, and management of the MIS function. Each of these processes is carried out at several levels: individual, group, organizational and inter-organizational. Identify behavioral issues of relevance for the cells defined by the process and level dimensions. Reading and discussion of the research literature surrounding the development, use, and implications of information technology.

**MIS 602: Introduction to Information Systems Research II**

(3-0) Cr. 3.

*Prereq: MIS 501 or equivalent, enrollment in PhD program*

Three fundamental areas of Information Systems, namely, infrastructure, management, and processes. Infrastructure studies examine the IT architecture including computing, communication, data, and application. Management focuses on addressing the value added notion of IT. Finally processing addresses topics related to enabling role of IT in myriad of areas.

**MIS 603: Seminar on IT Strategy and Structure**

(3-0) Cr. 3.

*Prereq: MIS 601*

Strategic issues in IT management. Address issues such as aligning IT strategy with corporate strategy and functional strategies, IT structure, valuation, governance and control, and related topics. Provide students with research skills related to the boundary between IT and the firm's external environment.

**MIS 604: Collaboration, Knowledge, and Intelligence in Organizations**

(3-0) Cr. 3.

*Prereq: MIS 601*

Research issues in the emerging areas of collaboration, knowledge management, and enterprise intelligence. Topics will include emerging and contemporary technologies of Data Mining, Knowledge Discovery from Databases, Web Mining, organizational memory, and knowledge management.

**MIS 605: Technical Research Methods in Information Systems**

Cr. 3. S.

*Prereq: MIS 501 or equivalent, enrollment in PhD program*

Focuses on analytical modeling and empirical analyses using methods drawn from economics, management science, and statistics/ econometrics, etc. Example topics include economics of information goods; impact of information technologies on firm performance and policy outcomes; and analysis of data generated from social media and business transactions.

**MIS 606: Economic Research Methods in Information Systems**

Cr. 3. S.

*Prereq: MIS 501 or equivalent, enrollment in PhD program*

Focuses on analytical modeling and empirical analyses using methods drawn from economics, management science, and statistics/ econometrics, etc. Example topics include economics of information goods; impact of information technologies on firm performance and policy outcomes; and analysis of data generated from social media and business transactions.

**MIS 620: Overview of MIS Research**

Cr. 3. Alt. F., offered odd-numbered years.

Introduce doctoral students to the most cited research in IS, as well as to various behavioral research methods. Readings on research topics will cover categories of IS knowledge including: IS development, IT & individuals, IT & groups, IT & organizations, and IT & markets.

**MIS 625: Analytical Research in Information Systems**

Cr. 3. Alt. S., offered odd-numbered years.

Mathematical models to capture the essence or abstractions of real-world problems and applying established techniques to derive optimal solutions or business insights. Application of theories and tools from operations research, economics, computer science, and statistics to tackle problems regarding the development, marketing, utilization, and management of information technologies and systems in organizations and the society.

**MIS 630: Empirical Research in MIS**

Cr. 3. Repeatable, maximum of 2 times. F.

Intermediate level statistical and econometric methods used in MIS research. Preparation to conduct rigorous longitudinal analyses. Statistical and econometric methods used to examine phenomena that can evolve with the passage of time. Methods used for analyzing cross-sectional data. Application of advanced empirical methods in combination with rigorous theoretical arguments.

**MIS 635: Computational Research in MIS**

Cr. 3.

Introduction for doctoral students to Information Systems research methods rooted in computational thinking. Topics include important issues in IS research that benefit from computational thinking; and computational methodologies commonly used in IS research.

**MIS 650: Research Practicum I**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a research manuscript to be submitted to a peer-reviewed academic journal. Students will work with a faculty mentor on a research project.

**MIS 651: Research Practicum II**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a second research manuscript to be submitted to a peer-reviewed academic journal. Although students work under the supervision of a faculty mentor, the students will take independent responsibility for the research project.

**MIS 655: Organizational and Social Implications of Human Computer Interaction**

(Cross-listed with HCI). (3-0) Cr. 3.

*Prereq: Graduate classification*

Examine opportunities and implications of information technologies and human computer interaction on social and organizational systems. Explore ethical and social issues appurtenant to human computer interaction, both from a proscriptive and prescriptive perspective. Develop informed perspective on human computer interaction. Implications on research and development programs.

**MIS 699: Research**

Cr. 3-6. Repeatable.

*Prereq: Graduate classification, permission of dissertation supervisor*  
Research.

## Marketing (MKT)

***Any experimental courses offered by MKT can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**MKT 340: Principles of Marketing**

(3-0) Cr. 3. F.S.SS.

*Prereq: credit or current enrollment in ECON 101*

The role of marketing in society. Markets, marketing institutions, and marketing functions with emphases on product, price, marketing communication, and marketing channel decisions.

**MKT 342: Foundation Of Personal Selling**

Cr. 3. F.S.

*Prereq: Sophomore status or above*

The process of selling and how to sell effectively. Focus on selling in a business environment and applying to concepts to general interpersonal settings in personal life. Students will actively participate in class, collaborate with teammates to develop skills to sell ideas and become more effective in representing themselves and their company and its products and services. Develop skills necessary to build long-term, profitable relationships with clients.

**MKT 351: Services Marketing**

(3-0) Cr. 3. F.

*Prereq: MKT 340*

In-depth appreciation and understanding of the unique challenges inherent in creating, managing, and delivering quality services. Students will be introduced to and have the opportunity to work with concepts, tools, and strategies that address these challenges.

**MKT 361: Social Media Marketing Strategy**

Cr. 3.

*Prereq: MKT 340*

The course will cover marketing, advertising and communications strategies in the new media landscape where traditional media (e.g., television, print) and the online social media (i.e., Web 2.0; e.g., online social networks, user-generated content, blogs, forums) co-exist. Students will be expected to have knowledge about the fundamentals of traditional advertising methods and strategies. With this background knowledge, the primary focus of this course will be on understanding social media, how to build social media marketing strategies, and how to track their effectiveness. This course will not look at more tactical aspects of advertising/communications such as creative, message management, and publicity. This will first and foremost be a marketing strategy course.

**MKT 362: Digital Marketing**

Cr. 3. F.S.SS.

*Prereq: MKT 340*

A survey course that explores key topics and competencies that will help formulate a digital marketing strategy and power a digital marketing campaign. Digital marketing is a broader toolkit that includes search engine marketing (SEM), search engine optimization (SEO), content marketing, mobile marketing, email marketing, landing page optimization, social media marketing, and more.

**MKT 367: Consultative Problem Solving**

(Cross-listed with MIS). Cr. 3. F.S.

*Prereq: Sophomore and above*

Consultative problem-solving approach to address complex problems in marketing and related fields. Topics include problem definition, issue tree dis-aggregation, hypotheses development and the Pyramid Principle. Development of skills such as formulating problems, structuring and prioritizing problems, synthesizing results and communicating intuition from quantitative analyses.

**MKT 368: Marketing Analytics**

(Cross-listed with MIS). (3-0) Cr. 3. F.S.

*Prereq: MKT 340, STAT 226*

Use of different tools to conduct various analyses to support marketing strategies. Topics include data visualization and exploration, forecasting, social media analytics and other marketing techniques. Development of skills such as structuring problems, and synthesizing results from quantitative analyses.

**MKT 410: Promotional Strategy**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340*

Principles, concepts, and problems involved in the development and implementation of promotional strategies. Coordination of a variety of promotional elements: advertising, sales promotion, direct marketing, public relations and publicity of web communications, and personal selling.

**MKT 442: Sales Management**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340, STAT 226*

Functional aspects of sales force management; personal selling methods; procedures for recruiting, selecting, and training new salespeople; compensation and expense control systems; problems of sales force motivation and supervision; methods of territorial and quota assignment; sales department budgets; distributor-dealer relations; other selected topics.

**MKT 443: Strategic Marketing Management**

(3-0) Cr. 3. F.S.SS.

*Prereq: MKT 342, MKT 444*

Analysis of major elements of strategic marketing management. May include case studies or business simulations involving decision making using marketing tools from previous courses. (For marketing majors only.).

**MKT 444: Fundamentals of Marketing Analytics**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340, STAT 226*

Marketing research techniques: problem formulation, research design, questionnaire construction, sampling, data collection procedures, and analysis and interpretation of data related to marketing decisions.

**MKT 445: Customer Relationship Management**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340, STAT 226*

Examines how customer data can be used to enhance decisions relating to acquisition, development and retention. Topics include customer lifetime value, customer as assets, customer loyalty programs and customization.

**MKT 447: Consumer Behavior**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340*

Study of how consumers select, purchase, use, and dispose of goods and services. Includes analyses of how markets and others influence these processes. Application of concepts and methods of the behavioral sciences to marketing management decision making.



**MKT 448: Global Marketing**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340*

Marketing from a global perspective and familiarity with the problems and perspectives that global companies face. Concepts and principles of marketing strategies, market assessment, identify marketing opportunities, entry decision, emerging markets, effects of political, legal, economic and cultural environments, and decisions relating to segmentation, positioning, branding, product, price, distribution and promotions in a global setting.

**MKT 450: Advanced Professional Selling**

(3-0) Cr. 3.

*Prereq: MKT 340 and either MKT 342 or I E 450*

Analysis of the theory and practice of personal selling with the context of relationship marketing and salesforce automation. Topics include: goal setting, prospecting, time/territory management, questioning, presentations, objections, commitment and customer service; simulations of selling situations.

**MKT 451: Omnichannel Marketing**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340*

Focuses on marketing channels, the downstream part of a value chain, companies that come together to bring products and services from their point of origin to the point of consumption. Topics include channel institutions, channel design, channel coordination and implementation. Highlights international and technological aspects of marketing channels so that students can successfully develop and manage marketing channels in a contemporary business environment.

**MKT 452: Sales Enablement Tools and Technology**

(3-0) Cr. 3. F.

*Prereq: MKT 340*

An applied study of the concepts, practice, and technical skills required to perform meaningful analytics in support of professional selling. Topics include: nature and aims of sales analytics; customer relationship management platform basics; sales data structure; data visualization; dashboard construction; predictive analytics; artificial intelligence.

**MKT 453: Brand Management**

(3-0) Cr. 3. F.S.

*Prereq: MKT 340*

Examines the role of brands and branding in market environments characterized by intense competition and consumer power. Covers issues relating to why branding is important to firms, what brands represent to consumers, and what should be done to manage them effectively.

**MKT 454: Entrepreneurial Marketing**

(Cross-listed with ENTSP). (3-0) Cr. 3. F.

*Prereq: MKT 340*

Basic understanding of marketing for those interested in creating or working for a start-up or an innovation-oriented company or consultancy. Relevant to marketing roles in entrepreneurial firms across both B2B and B2C markets. Integrates theory and practice, and provides insight into how entrepreneurs take both strategic and tactical marketing decisions in uncertain business environments. For hands-on perspective, incorporates projects involving real-world marketing problems confronting start-ups, and guest talks from entrepreneurs and frequent case analyses.

**MKT 484: Technology, Globalization and Culture**

(Dual-listed with MKT 584). (Cross-listed with M E, WLC). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**MKT 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: MKT 340, senior classification; permission of instructor***MKT 492: Comparative Marketing**

(3-0) Cr. 3. SS.

*Prereq: MKT 340*

Provides experience to students in culture, social, economic, and political environment of marketing in a foreign country. Students complete a term project (e.g., a marketing plan) based on information collected in the foreign country. Students attend briefings by experts/officials of private and public organizations.

**MKT 495: Live Cases in Marketing**

(3-0) Cr. 3. Repeatable, maximum of 4 times. F.S.

*Prereq: MKT 340*

Teamwork with companies to solve their current marketing challenges. Opportunity to gain critical thinking skills, experience with quantitative analysis, client management experience, professional presentation skills, strategies for effective teamwork, practice giving and receiving feedback, and practical marketing experience. Experience will strengthen student resume, make connections with industry, and practice applying marketing concepts in real-world situations. The companies and challenges will be different each semester. Only 3 credits of MKT 495 may count as a MKT major or minor choice elective.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MKT 501: Marketing**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or departmental permission*

An analytical approach to the study of marketing issues and challenges of business firms and nonprofit organizations. Emphasis on the influence of the global marketplace and the marketing environment on marketing decision making; the determination of the organization's products, prices, channels and communication strategies; an orientation that ensures sustainability of marketing operations; and the organization's system for planning and controlling its marketing effort.

**MKT 542: New Product Strategy and Analytics**

(3-0) Cr. 3. S.

*Prereq: MKT 501 and Graduate Classification or Instructor Permission*

Principles and concepts of new product development and introduction; decision areas include market definition and structure, idea generation, concept evaluation, test marketing, launch tracking, and global product planning; models and techniques of new product evaluation used by consumer product companies.

**MKT 547: Consumer Behavior**

(3-0) Cr. 3. S.

*Prereq: MKT 501 and Graduate Classification or Instructor Permission*

The behavior of consumers. Intensive review of literature from relevant disciplines. Applications of concepts and methods of the behavioral sciences to marketing management decision making.

**MKT 552: Strategic Marketing Analytics**

Cr. 3.

*Prereq: Business Analytics students only and must have knowledge of R or Python*

Integrate various concepts to solve problems in marketing. Enhance skills such as formulating problems, structuring and prioritizing problems, synthesizing results and communicating intuition from complicated analyses. Topics include problem definition, issue tree dis-aggregation and the Pyramid Principle. Overview of various newly developed marketing theories and analytical tools.

**MKT 568: Marketing Analytics**

(Cross-listed with MIS). Cr. 3. F.S.

*Prereq: Graduate Classification or Instructor Permission and must have knowledge of R or Python*

Integration of various concepts to solve problems using appropriate tools. Specifically, the course consist of the following three components: (a) help students develop consultative problem-solving skills; (b) introduce various newly developed consumer behavior theories; (c) provide an overview of quantitative models in the field of marketing analytics. Hands-on experiences to enhance skills such as formulating problems, structuring and prioritizing problems, synthesizing results and communicating intuition from complicated analyses.

**MKT 584: Technology, Globalization and Culture**

(Dual-listed with MKT 484). (Cross-listed with M E, WLC). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**MKT 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

For students wishing to do individual research in a particular area of marketing.

**Courses for graduate students:**

**MKT 601: Seminar in Consumer Behavior**

(3-0) Cr. 3.

*Prereq: MGMT 601*

A rigorous foundation of the major conceptual and methodological paradigms in the consumer-behavior literature. Seeks to aid students in understanding the psychological, sociological, and anthropological roots of consumer behavior research. Read the latest research in the area reported in leading consumer behavior/psychology journals.

**MKT 602: Marketing Strategy**

(3-0) Cr. 3.

*Prereq: MGMT 601*

Review major contributions and recent developments in marketing strategy research and practice. Review commonly used modeling approaches and research methods to study strategic interaction between firms seeking to build competitive advantages. Provide an overview of empirical research regarding measurement, level and persistence of business success and implications of findings for theory and strategy development.

**MKT 603: Marketing Strategy II**

(3-0) Cr. 3.

*Prereq: MKT 601*

Addresses key strategy and implementation issues behind customer management. Topics such as typology of CM strategies, antecedents and outcomes; environmental and managerial influences on strategy formation; technology and impact on CM strategy; and value of CM strategy. Examine theories and concepts behind important CM issues such as customer satisfaction, customer loyalty and customer profitability.

**MKT 604: Marketing Issues in Inter-Organizational Relations**

(3-0) Cr. 3.

*Prereq: MGMT 602*

Inter-firm and network competition; relationship among suppliers, distributors, alliance partners, external employees, and internal employees. Theories including agency theory, network theory, relationship marketing, channels of distribution theories on cooperation versus competition, IOS theories.

**MKT 605: Marketing Analytics: Quantitative Models and Applications**

Cr. 3. Repeatable, maximum of 3 times. Alt. F., offered odd-numbered years.

Survey of quantitative methods used in the field of marketing analytics. Topics include discrete choice models, unobserved heterogeneity, endogeneity, Hidden Markov models and other newly-developed techniques. Understand, develop and estimate quantitative models and understand main topics in marketing analytics.

**MKT 606: Seminar in Consumer Behavior II**

Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MKT 601*

A rigorous foundation of the major conceptual and methodological paradigms in the consumer-behavior literature. Seeks to further develop and study issues contained in MKT 601.

**MKT 650: Research Practicum I**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a research manuscript to be submitted to a peer-reviewed academic journal. Students will work with a faculty mentor on a research project.

**MKT 651: Research Practicum II**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a second research manuscript to be submitted to a peer-reviewed academic journal. Although students work under the supervision of a faculty mentor, the students will take independent responsibility for the research project.

**MKT 699: Dissertation**

Cr. 12.

*Prereq: Graduate classification, permission of dissertation supervisor*  
Research.

## Materials Engineering (MAT E)

***Any experimental courses offered by MAT E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****MAT E 101: Materials Science & Engineering Learning Community Seminar**

Cr. R. F.

Introduction to the Materials Science & Engineering Department and resources available to support student success. Offered on a satisfactory-fail basis only.

**MAT E 170: Numeric, Symbolic, and Graphical Methods for Materials Engineering**

Cr. 3. S.

*Prereq: ENGR 160*

Introduction to computer-based problem solving techniques including data analysis, data visualization, and materials simulation using spreadsheet, array, and symbolic methods that are necessary for materials science. Introduction to 3D CAD with consideration for additive manufacturing techniques.

**MAT E 214: Structural Characterization of Materials**

(2-2) Cr. 3. F.S.

*Prereq: MAT E 215; PHYS 231*

Structural characterization of materials. Techniques include optical and electron microscopy, x-ray diffraction, and thermal analysis. Identification of materials type, microstructure, and crystal structure.

**MAT E 215: Introduction to Materials Science and Engineering I**

(3-0) Cr. 3. F.S.

*Prereq: (CHEM 167 or CHEM 177); MATH 165*

Introduction to the structure and properties of engineering materials. Structure of crystalline solids and imperfections. Atomic diffusion. Mechanical properties and failure of ductile and brittle materials. Dislocations and strengthening mechanisms. Phase equilibria, phase transformations, microstructure development, and heat treatment principles of common metallurgical systems including steels and aluminum alloys. Engineering applications. Only one of MAT E 215, MAT E 273, or MAT E 392 may count toward graduation.

**MAT E 215L: Introduction to Materials Science and Engineering I - Lab**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in MAT E 215 or MAT E 273 or MAT E 392*

Materials Engineering majors only. Laboratory exercise in materials.

**MAT E 216: Introduction to Materials Science and Engineering II**

(3-0) Cr. 3. F.S.

*Prereq: (MAT E 215 or MAT E 273 or MAT E 392); credit or concurrent enrollment in PHYS 232*

Materials Engineering majors only. Fundamentals of ceramic, polymeric, and composite materials; degradation, electronic, thermal, magnetic, and optical properties of materials. Materials for energy, biomaterials, and nanomaterials.

**MAT E 216L: Introduction to Materials Science and Engineering II - Lab**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in MAT E 216*

Materials Engineering majors only. Laboratory exercise in materials.

**MAT E 220: Globalization and Sustainability**

(Cross-listed with ANTHR, ENV S, GLOBE, M E, SOC). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**MAT E 273: Principles of Materials Science and Engineering**

(3-0) Cr. 3. F.S.

*Prereq: (CHEM 167 or CHEM 177); MATH 165*

Introduction to the structure and properties of engineering materials. Structure of crystalline solids and imperfections. Atomic diffusion. Mechanical properties and failure of ductile and brittle materials. Dislocations and strengthening mechanisms. Phase equilibria, phase transformations, microstructure development, and heat treatment principles of common metallurgical systems including steels and aluminum alloys. Structure and mechanical properties of ceramic, polymeric and composite materials. Thermal properties of materials. Corrosion and degradation. Basic electronic properties of materials. Engineering applications. Only one of MAT E 215, MAT E 273, or MAT E 392 may count toward graduation

**MAT E 301: Materials Engineering Professional Planning**

Cr. R. S.

*Prereq: Sophomore classification in Materials Engineering*

Preparation for a career in industry or advanced study in graduate school; Lectures and guest speakers discuss various topics, including: experiential learning, resumes, interviewing, leadership, networking, professional ethics, and graduate school opportunities. Offered on a satisfactory-fail basis only.

**MAT E 311: Thermodynamics in Materials Engineering**

(3-0) Cr. 3. F.

*Prereq: CHEM 178; (MAT E 215 or MAT E 273 or MAT E 392); credit or concurrent enrollment in (MAT E 216 and MATH 267)*

Basic laws of thermodynamics applied to phase equilibria, transformations, and reactions in multicomponent multiphase materials systems; thermodynamic descriptions of heterogeneous systems; binary and ternary phase diagrams; interfaces, surfaces, and defects.

**MAT E 314: Kinetics and Phase Equilibria in Materials**

(3-0) Cr. 3. S.

*Prereq: MAT E 214; MAT E 216; MAT E 311*

Kinetic phenomena and phase equilibria relevant to the origins and stability of microstructure in metallic, ceramic and polymeric systems. Application of thermodynamics to the understanding of stable and metastable phase equilibria, interfaces and their effects on stability: defects and diffusion, empirical rate equations for transformation kinetics, driving forces and kinetics of nucleation, diffusional and diffusionless phase transformations.

**MAT E 317: Introduction to Electronic Properties of Ceramic, Metallic, and Polymeric Materials**

(3-0) Cr. 3. F.

*Prereq: MAT E 216; PHYS 232*

Materials Engineering majors only. Introduction to electronic properties of materials and their practical applications. Classical conduction models and electronic properties of metallic and ceramic materials. Elementary quantum mechanics and band theory of electron states in solids. Quantum theory of metallic conduction. Elementary semiconductor theory and devices. Polarization and dielectric properties of materials. Electron conduction in polymeric systems.

**MAT E 319: Mechanics of Structures and Materials**

(3-0) Cr. 3. S.

*Prereq: PHYS 231; credit or concurrent enrollment in MATH 166*

Fundamentals of engineering mechanics as applied to materials. Forces and moments; stresses in loaded bodies; elasticity and stress analysis including stress / strain relationships. Only one of MAT E 319 or E M 324 may be used for graduation requirements.

**MAT E 321: Introduction to Ceramic Science**

(3-0) Cr. 3. F.

*Prereq: MAT E 216*

Ceramic crystal structures, defects, diffusion and transport. Phase equilibria and microstructures. Thermal, electronic, optical and magnetic properties of ceramics.

**MAT E 322: Introduction to Ceramic Processing**

(2-3) Cr. 3. S.

*Prereq: MAT E 321*

Synthesis and characterization of ceramic powders. Colloidal phenomena, rheology of suspensions, ceramic forming methods, and drying. High temperature ceramic reactions, liquid and solid-state sintering, grain growth, microstructure development. Processing/microstructure/property relationships.

**MAT E 332: Semiconductor Materials and Devices**

(Cross-listed with E E). (3-0) Cr. 3. S.

*Prereq: CPR E and E E majors: E E 230, MAT E majors: MAT E 317*

Introduction to semiconductor material and device physics. Quantum mechanics and band theory of semiconductors. Charge carrier distributions, generation/recombination, transport properties. Physical and electrical properties and fabrication of semiconductor devices such as MOSFETs, bipolar transistors, laser diodes and LED's.

**MAT E 334: Electronic & Magnetic Properties of Metallic Materials**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MAT E 317*

Electronic conduction in metals and the properties of conducting materials. Quantum mechanical behavior of free electrons and electrons in potentials wells, bonds and lattices. Development of the band theory of electron states in solids and the Free and Nearly Free Electron models. Density-of-states in energy bands and the Fermi-Dirac statistics of state occupancy. Quantum mechanical model of metallic conduction; Brillouin zones and Fermi surfaces. Additional topics include the thermal properties of metals, electron phase transitions in metallic alloys and the BCS theory of superconductivity. Classical and quantum mechanical treatment of the origins of magnetism in materials; orbital and spin angular momentum. Theory of magnetic behavior in dia-, para-magnetic, ferromagnetic materials.

**MAT E 341: Metals Processing**

(3-0) Cr. 3. F.

*Prereq: MAT E 215 or MAT E 273 or MAT E 392*

Theory and practice of metal processing, including: extractive metallurgy; casting and solidification; welding and joining; deformation processes (e.g., forging, extrusion); powder metallurgy; and additive manufacturing.

**MAT E 342: Structure/Property Relations in Nonferrous Metals**

(3-0) Cr. 3. S.

*Prereq: MAT E 215 or MAT E 273 or MAT E 392*

Processing of metals and alloys to obtain desired mechanical properties by manipulation of their microstructure and composition of constituent phase(s). Relevance of defects to mechanical properties, plastic flow. Strengthening mechanisms in metals and alloys. Microstructure, heat treatment and mechanical properties of engineering alloys. Metal-matrix composites.

**MAT E 348: Solidification Processes**

(Cross-listed with I E). (2-2) Cr. 3. S.

*Prereq: I E 248 and MAT E 273, or MAT E 215*

Theory and applications related to metal casting, welding, polymer processing, powder metallurgy, and composites manufacturing, and related rapid manufacturing processes.

**MAT E 350: Polymers and Polymer Engineering.**

(3-0) Cr. 3. S.

*Prereq: MAT E 216 or MAT E 273 or MAT E 392*

Fundamental concepts of soft matter, including polymer, colloid and surfactant. Their physical and chemical properties, rheology and production methods. Applications of polymers in the chemical industry. Related topics in surface, diffusion and stability.

**MAT E 351: Introduction to Polymeric Materials**

(3-0) Cr. 3. F.

*Prereq: MAT E 216*

Introduction to polymeric materials, synthesis, structure and properties. Relationship between polymer composition, processing and properties.

**MAT E 362: Principles of Nondestructive Testing**

(Cross-listed with E M). (3-0) Cr. 3. S.

*Prereq: PHYS 132 or PHYS 232*

Radiography, ultrasonic testing, magnetic particle inspection, eddy current testing, dye penetrant inspection, and other techniques. Physical bases of tests, materials to which applicable, types of defects detectable, calibration standards, and reliability safety precautions.

**MAT E 362L: Nondestructive Testing Laboratory**

(Cross-listed with E M). (0-3) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in E M 362 or MAT E 362*

Application of nondestructive testing techniques to the detection and sizing of flaws in materials and to the characterization of material's microstructure. Included are experiments in hardness, dye penetrant, magnetic particle, x-ray, ultrasonic and eddy current testing. Field trips to industrial laboratories.

**MAT E 391: Introduction to US Women's Roles in Industry and Preparation for Summer Study**

(3-0) Cr. 3. S.

*Prereq: Permission of Instructor*

Introduction to the historical role of women as related to US industry, family and community with emphasis on the years 1830 - 1945, but also related to the current climate. Topics completed in 392 with arranged lectures at Brunel University. Orientation for Brunel summer study program. Offered on a satisfactory-fail basis only. Credit for graduation allowable only upon completion of summer study abroad program.

**MAT E 392: Principles of Materials Science and Engineering**

(3-0) Cr. 3. SS.

*Prereq: (CHEM 167 or CHEM 177); MATH 165; MAT E 391*

Introduction to the structure and properties of engineering materials. Structure of crystalline solids and imperfections. Atomic diffusion. Mechanical properties and failure of ductile and brittle materials. Dislocations and strengthening mechanisms. Phase equilibria, phase transformations, microstructure development, and heat treatment principles of common metallurgical systems including steels and aluminum alloys. Structure and mechanical properties of ceramic, polymeric and composite materials. Thermal properties of materials. Corrosion and degradation. Basic electronic properties of materials. Engineering applications. Only one of MAT E 215, MAT E 273, or MAT E 392 may count toward graduation. Meets International Perspectives Requirement.

**MAT E 413: Materials Design and Professional Practice I**

(3-0) Cr. 3. F.S.

*Prereq: Senior classification*

Fundamentals of materials engineering design, information sources, team behavior, professional preparation, and materials selection. Analysis of design problems, development of solutions, selected case studies. Oral presentation skills. Preparations for continued project in MAT E 414. MAT E 413-414 sequence is intended for students in their final two semesters before graduation.

**MAT E 414: Materials Design and Professional Practice II**

(2-2) Cr. 3. F.S.

*Prereq: MAT E 413*

Team projects specified by either industry or academic partners. Written and oral final project reports. Integration of materials processing, structure/composition, properties and performance principles in materials engineering problems. Multi-scale design of materials, materials processing, case studies including cost analysis, ethics, risk and safety.

**MAT E 418: Mechanical Behavior of Materials**

(3-0) Cr. 3. F.S.

*Prereq: MAT E 216; credit or concurrent enrollment in MAT E 319*

Mechanical behavior of ceramics, metals, polymers, and composites. Relationships between materials processing and atomic aspects of elasticity, plasticity, creep, fracture, and fatigue. Life prediction, stress-and failure analysis.

**MAT E 419: Magnetism and Magnetic Materials**

(Dual-listed with M S E 519). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E E 311 or MAT E 317 or PHYS 364*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, magnetic measurements of properties for materials evaluation.



**MAT E 425: Glass Science and Engineering**

(2-3) Cr. 3. F.

*Prereq: MAT E 321*

Composition, structure, properties manufacturing, and applications of inorganic glasses. Mechanical, structural, thermal, optical, ionic, electronic, and biological applications of inorganic glasses, especially silicate glasses. Contemporary topics in glass science and engineering such as glass optical fiber communication and flat panel display technologies. Laboratory exercises in the preparation and characterization of silicate glasses.

**MAT E 432: Microelectronics Fabrication Techniques**

(Dual-listed with M S E 532). (Cross-listed with E E). (2-4) Cr. 4.

*Prereq: CPR E and E E majors: E E 230; MAT E majors: MAT E 317*

Techniques used in modern integrated circuit fabrication, including diffusion, oxidation, ion implantation, lithography, evaporation, sputtering, chemical-vapor deposition, and etching. Process integration. Process evaluation and final device testing. Extensive laboratory exercises utilizing fabrication methods to build electronic devices. Use of computer simulation tools for predicting processing outcomes. Recent advances in processing CMOS ICs and micro-electro-mechanical systems (MEMS).

**MAT E 433: Advanced Ceramics and Electronic Materials**

(3-0) Cr. 3. S.

*Prereq: MAT E 317; MAT E 321*

Charged point defects and formation equations. Non-stoichiometric conductors, dielectric, ferroelectric, and piezoelectric materials and applications. Optical properties, optical spectra of materials, optoelectronic devices. Magnetic and superconducting materials. Contemporary topics in advanced ceramics.

**MAT E 437: Electronic Properties of Materials**

(Dual-listed with M S E 537). (Cross-listed with E E). Cr. 3. S.

*Prereq: E E 332 or MAT E 317 or PHYS 322*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, biomedical applications of magnetism, magnetic evaluation of materials.

**MAT E 443: Physical Metallurgy of Ferrous Alloys**

(3-0) Cr. 3. F.

*Prereq: MAT E 311*

Production and processing of ferrous metals. Extraction of pig iron from ore. Steelmaking processes. Equilibrium and nonequilibrium phases in the Fe-C system. Properties and processing of cast irons, plain carbon and alloy steels, stainless and specialty steels. Transformation diagrams, hardenability, and surface treatments. Continuous casting, forging, hot rolling, quenching, and tempering as they apply to ferrous materials. Cost and mechanical performance considerations in cast iron and steel selection and heat treatment.

**MAT E 444: Corrosion and Failure Analysis**

(2-2) Cr. 3. S.

*Prereq: MAT E 215 or MAT E 273 or MAT E 392*

Failure analysis. Characteristics of common types of metallic failures, case studies of failures, designing to reduce failure risk. Corrosion and corrosion control of metallic systems. Corrosion fundamentals, classification of different types of metallic corrosion, corrosion properties of various engineering alloys, corrosion control.

**MAT E 452: Scanning and Auger Electron Microscopy**

(Dual-listed with M S E 552). (2-3) Cr. 3. F.

*Prereq: PHYS 232*

Characterization of materials using scanning electron microscope (SEM), electron microprobe, and auger spectrometer. Compositional determination using energy and wavelength dispersive x-ray and Auger spectroscopies. Specimen preparation. Laboratory covers SEM operation.

**MAT E 453: Physical and Mechanical Properties of Polymers**

(Dual-listed with M S E 553). (2-3) Cr. 3. F.

*Prereq: MAT E 351*

Overview of polymer chemical composition, microstructure, thermal and mechanical properties, rheology, and principles of polymer materials selection. Intensive laboratory experiments include chemical composition studies, microstructural characterization, thermal analysis, and mechanical testing.

**MAT E 454: Polymer Composites and Processing**

(Dual-listed with M S E 554). (3-0) Cr. 3. S.

*Prereq: MAT E 351*

Basic concepts in polymer composites, blends, and block copolymers. Phase separation and miscibility, microstructures and mechanical behavior. Fiber reinforced and laminated composites. Viscosity, rheology, viscoelasticity of polymers. Polymer melt processing methods such as injection molding and extrusion; selection of suitable processing methods and their applications.

**MAT E 456: Biomaterials**

(Dual-listed with M S E 556). (Cross-listed with B M E). (3-0) Cr. 3. F.

*Prereq: CHEM 178; (MAT E 216 or MAT E 273 or MAT E 392)*

Presentation of the basic chemical and physical properties of biomaterials, including metals, ceramics, and polymers, as they are related to their manipulation by the engineer for incorporation into living systems. Role of microstructure properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

**MAT E 457: Chemical and Physical Metallurgy of Rare Earth Metals**

(Dual-listed with M S E 557). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: CHEM 325 or MAT E 311*

Electronic configuration, valence states, minerals, ores, beneficiation, extraction, separation, metal preparation and purification. Crystal structures, phase transformations and polymorphism, and thermochemical properties of rare earth metals. Chemical properties: inorganic and organometallic compounds, alloy chemistry, nature of the chemical bonding. Physical properties: mechanical and elastic properties, magnetic properties, resistivity, and superconductivity.

**MAT E 488: Eddy Current Nondestructive Evaluation**

(Dual-listed with M S E 588). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 265 and (MAT E 216 or MAT E 273 or MAT E 392 or E E 311 or PHYS 364)*

Electromagnetic fields of various eddy current probes. Probe field interaction with conductors, cracks and other material defects. Ferromagnetic materials. Layered conductors. Elementary inversion of probe signals to characterize defects. Special techniques including remote-field, transient, potential drop nondestructive evaluation and the use of Hall sensors. Practical assignments using a 'virtual' eddy current instrument will demonstrate key concepts.

**MAT E 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Department*

Investigation of individual research or special topics. Independent study that is being proposed to be used toward graduation or minor requirements. This course requires an approved proposal to the MSE Department's Undergraduate Curriculum Committee prior to the beginning of the semester.

**MAT E 490H: Independent Study: Senior Honors Project**

Cr. arr. F.S.SS.

*Prereq: Permission of Department*

Independent study that is being proposed to be used for an honors project. This course requires an approved proposal to the College of Engineering Honors Committee.

**MAT E 499: Undergraduate Research Opportunity**

Cr. R. Repeatable, maximum of 12 times. F.S.SS.

*Prereq: Permission of Department*

Independent study working in research lab with faculty member.

Designed to allow students opportunity to gain experience that may assist them in obtaining future employment. Offered on a satisfactory-fail basis only. The course cannot be applied toward any graduation requirements.

## Materials Science and Engineering (M S E)

*Any experimental courses offered by M S E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**M S E 501: Fundamentals of Materials Science and Engineering I**

(1-0) Cr. 1. F.

An examination of structure-property-process relationships in materials, focusing on control and measurement of end-use performance characteristics. Materials design fundamentals are discussed as they pertain to various critical industries, applications, and manufacturing technologies. Offered on a satisfactory-fail basis only.

**M S E 502: Fundamentals of Materials Science and Engineering II**

(1-0) Cr. 1. Repeatable, maximum of 1 credits. S.

*Prereq: M S E 501*

An examination of the physical behavior of materials, as underpinned by multiphase multicomponent thermodynamics, transport phenomena, interfaces, defect structures, the kinetics of phase transformations, and the mechanistic origins of structure-property-processing relationships in various types of materials. Offered on a satisfactory-fail basis only.

**M S E 503: Fundamentals of Materials Science and Engineering III**

(1-0) Cr. 1. SS.

*Prereq: M S E 501, M S E 502 and enrollment in the M S E Ph.D. program*

Directed study of advanced topics in Materials Science and Engineering. Fundamental principles and relationships connecting structure, chemistry, stability, physical behavior, properties, and processing response are reviewed. Experimental and computational methods for materials research are emphasized. Offered on a satisfactory-fail basis only.

**M S E 510: Fundamentals of Structure and Chemistry of Materials**

(3-0) Cr. 3. F.

*Prereq: MATH 165, PHYS 221, and CHEM 167*

Geometric and algebraic representations of symmetry. Pair distribution function. Structure, chemistry, and basic properties of covalent, ionic, and metallic solids, glasses and liquids, and polymers. Interactions of materials with particles and waves. Relationships between direct and reciprocal spaces. The kinematical theory of diffraction, with an introduction to the dynamical theory.

**M S E 519: Magnetism and Magnetic Materials**

(Dual-listed with MAT E 419). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: E E 311 or MAT E 317 or PHYS 364*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, magnetic measurements of properties for materials evaluation.

**M S E 520: Thermodynamics and Kinetics in Multicomponent Materials**

(3-0) Cr. 3. F.

*Prereq: MAT E 311 or CHEM 321, MATH 266 or MATH 267*

A review of the fundamental principles of heat, work, basic thermodynamic relations, and criteria for equilibrium. Analytical treatments for the thermodynamic description of multicomponent chemical solutions and reacting systems are developed and employed to predict phase equilibria in materials systems. Builds on the thermodynamic construction to treat the kinetics of chemical reactions and phase transformations. Topics include general first order and second order transitions, along with chemical diffusion. Detailed examples involving nucleation and diffusion limited growth, spinodal decomposition, martensitic transformations, magnetic and electric transitions, and glass formation will be considered.

**M S E 521: Mechanical Behavior and Manufacturing of Polymers and Composites**

(Cross-listed with M E). (3-0) Cr. 3. S.

*Prereq: M E 324, E M 324*

Effect of chemical structure and morphology on properties. Linear viscoelasticity, damping and stress relaxation phenomena. Structure and mechanics of filler and fiber reinforced composites. Mechanical properties and failure mechanisms. Material selection and designing with polymers. Processing of polymer and composite parts.

**M S E 530: Solid State Science**

(3-0) Cr. 3. S.

*Prereq: MAT E 334 or E E 332 or PHYS 322*

Development of a quantitative description of the electronic structure of solids starting with fundamentals of atoms, atomic bonding, basic crystallography, and band theory of solids. Continuum properties of solids in response to electromagnetic fields and thermal gradients. Quantitative description of the atomistic properties of solids through electron-electron interactions, electron-phonon interactions, and dipole interactions.

**M S E 532: Microelectronics Fabrication Techniques**

(Dual-listed with MAT E 432). (Cross-listed with E E). (2-4) Cr. 4.

*Prereq: CPR E and E E majors: E E 230; MAT E majors: MAT E 317*

Techniques used in modern integrated circuit fabrication, including diffusion, oxidation, ion implantation, lithography, evaporation, sputtering, chemical-vapor deposition, and etching. Process integration. Process evaluation and final device testing. Extensive laboratory exercises utilizing fabrication methods to build electronic devices. Use of computer simulation tools for predicting processing outcomes. Recent advances in processing CMOS ICs and micro-electro-mechanical systems (MEMS).

**M S E 537: Electronic Properties of Materials**

(Dual-listed with MAT E 437). (Cross-listed with E E). Cr. 3. S.

*Prereq: E E 332 or MAT E 317 or PHYS 322*

Magnetic fields, flux density and magnetization. Magnetic materials, magnetic measurements. Magnetic properties of materials. Domains, domain walls, domain processes, magnetization curves and hysteresis. Types of magnetic order, magnetic phases and critical phenomena. Magnetic moments of electrons, theory of electron magnetism. Technological application, soft magnetic materials for electromagnets, hard magnetic materials, permanent magnets, magnetic recording technology, biomedical applications of magnetism, magnetic evaluation of materials.

**M S E 540: Mechanical Behavior of Materials**

(3-0) Cr. 3. S.

*Prereq: MAT E 418, MATH 266 or MATH 267*

Mechanical behavior of materials with emphasis on micromechanics of deformation in three generic regimes: elasticity, plasticity, and fracture. A materials science approach is followed to understand and model the mechanical behavior that combines continuum mechanics, thermodynamics, kinetics, and microstructure. Some topics include elastic properties of materials, permanent deformation mechanisms at different temperatures (e.g., via dislocation motion and creep), and fracture in ductile and brittle materials. Specific classes of materials that are studied: metals, ceramics, polymers, glasses and composites.

**M S E 550: Nondestructive Evaluation**

(Cross-listed with E M). (3-2) Cr. 4. S.

*Prereq:* E M 324, MATH 385

Principles of five basic NDE methods and their application in engineering inspections. Materials behavior and simple failure analysis. NDE reliability, and damage-tolerant design. Advanced methods such as acoustic microscopy, laser ultrasonics, thermal waves, and computed tomography are analyzed. Computer-based experiments on a selection of methods: ultrasonics, eddy currents, x-rays are assigned for student completion.

**M S E 551: Characterization Methods in Materials Science**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* MAT E 214

Characterization of ceramic, metal, polymer and glassy materials using modern analytical techniques. Spectroscopic (IR, Raman, UV/VIS/NIR, and NMR), thermal (DSC, DTA/TGA, and DMA) methods, mechanical and rheological testing, magnetic and electrical characterization, and powder characterization.

**M S E 552: Scanning and Auger Electron Microscopy**

(Dual-listed with MAT E 452). (2-3) Cr. 3. F.

*Prereq:* PHYS 232

Characterization of materials using scanning electron microscope (SEM), electron microprobe, and auger spectrometer. Compositional determination using energy and wavelength dispersive x-ray and Auger spectroscopies. Specimen preparation. Laboratory covers SEM operation.

**M S E 553: Physical and Mechanical Properties of Polymers**

(Dual-listed with MAT E 453). (2-3) Cr. 3. F.

*Prereq:* MAT E 351

Overview of polymer chemical composition, microstructure, thermal and mechanical properties, rheology, and principles of polymer materials selection. Intensive laboratory experiments include chemical composition studies, microstructural characterization, thermal analysis, and mechanical testing.

**M S E 554: Polymer Composites and Processing**

(Dual-listed with MAT E 454). (3-0) Cr. 3. S.

*Prereq:* MAT E 351

Basic concepts in polymer composites, blends, and block copolymers. Phase separation and miscibility, microstructures and mechanical behavior. Fiber reinforced and laminated composites. Viscosity, rheology, viscoelasticity of polymers. Polymer melt processing methods such as injection molding and extrusion; selection of suitable processing methods and their applications.

**M S E 556: Biomaterials**

(Dual-listed with MAT E 456). (3-0) Cr. 3. F.

*Prereq:* CHEM 178; (MAT E 216 or MAT E 273 or MAT E 392)

Presentation of the basic chemical and physical properties of biomaterials, including metals, ceramics, and polymers, as they are related to their manipulation by the engineer for incorporation into living systems. Role of microstructure properties in the choice of biomaterials and design of artificial organs, implants, and prostheses.

**M S E 557: Chemical and Physical Metallurgy of Rare Earth Metals**

(Dual-listed with MAT E 457). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* CHEM 325 or MAT E 311

Electronic configuration, valence states, minerals, ores, beneficiation, extraction, separation, metal preparation and purification. Crystal structures, phase transformations and polymorphism, and thermochemical properties of rare earth metals. Chemical properties: inorganic and organometallic compounds, alloy chemistry, nature of the chemical bonding. Physical properties: mechanical and elastic properties, magnetic properties, resistivity, and superconductivity.

**M S E 564: Fracture and Fatigue**

(Cross-listed with AER E, E M, M E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.

*Undergraduates:* Permission of instructor

Materials and mechanics approach to fracture and fatigue.

Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**M S E 569: Mechanics of Composite and Combined Materials**

(Cross-listed with AER E, E M). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* E M 324

Mechanics of fiber-reinforced materials. Micromechanics of lamina. Macromechanical behavior of lamina and laminates. Strength and interlaminar stresses of laminates. Failure criteria. Stress analysis of laminates. Thermal moisture and residual stresses. Joints in composites.

**M S E 581: Computational Modeling of Materials**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* (MATH 265 and MAT E 311) or CH E 381 or CHEM 325 or PHYS 304

Introduction to the basic methods used in the computational modeling and simulation of materials, from atomistic simulations to methods at the mesoscale. Students will be expected to develop and run sample programs. Topics to be covered include, for example, electronic structure calculations, molecular dynamics, Monte Carlo, phase-field methods, etc.

**M S E 588: Eddy Current Nondestructive Evaluation**

(Dual-listed with MAT E 488). (Cross-listed with E E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* MATH 265 and (MAT E 216 or MAT E 273 or MAT E 392 or E E 311 or PHYS 364)

Electromagnetic fields of various eddy current probes. Probe field interaction with conductors, cracks and other material defects. Ferromagnetic materials. Layered conductors. Elementary inversion of probe signals to characterize defects. Special techniques including remote-field, transient, potential drop nondestructive evaluation and the use of Hall sensors. Practical assignments using a 'virtual' eddy current instrument will demonstrate key concepts.

**M S E 590: Special Topics**

Cr. arr. Repeatable.

*Prereq:* Permission of instructor

**M S E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:****M S E 601: Materials Seminar**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq:* MSE Graduate Student Status

Seminar course - presentations given on a weekly basis by leading U.S. and International researchers that are experts in their respective fields closely related to Materials Science. Offered on a satisfactory-fail basis only.

**M S E 620: Fundamentals of Phase Transformations**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* M S E 520

Explores various advanced theoretical treatments of the energetics and kinetics of multicomponent materials. Topics include analytical and computational descriptions of thermodynamic quantities, experimental measurement of essential physical properties, analytical and computational treatments of kinetic processes, and the use of theoretical predictions of phase equilibria and evolution in materials systems.

**M S E 630: Physical Properties of Solids**

(3-0) Cr. 3.

*Prereq:* M S E 530

Advanced course in the behavior of solids within the framework of solid state physics and chemistry. Includes magnetic, dielectric, transport, and optical phenomena in solids. Influence of phase transformations and crystal symmetry on the physical properties.

**M S E 651: Powder Diffraction Methods**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* M S E 510

Advanced structural characterization of materials using powder diffraction. Production of X-ray and neutron radiation. Review of symmetry, group and kinematical theories of diffraction. Mathematical and computational backgrounds of powder diffraction data. Introduction to single crystal diffraction methods, origin of powder diffraction pattern, history of the technique. Modern powder diffraction methods. Indexing of powder diffraction patterns, figures of merit, precise lattice parameters. Phase problem, determining crystal structures from symmetry and geometry, Patterson, direct and Fourier methods. Rietveld method, precise crystal structures: atomic parameters, qualitative and quantitative phase identification, preferred orientation, grain size, strain, residual stress, order-disorder. Powder diffraction at non-ambient conditions. Applications of powder diffraction: data bases, phase transformations, phase diagrams, local structures, magnetism.

**M S E 652: Transmission Electron Microscopy**

(2-3) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* M S E 510

Theory and application of transmission electron microscopy to inorganic materials. Specimen preparation, selected area and convergent beam electron diffraction, bright field/dark field/high resolution imaging. Compositional analysis using X-ray and electron energy loss spectroscopy.

**M S E 690: Advanced Topics in Materials Science**

Cr. arr. Repeatable.

*Prereq:* Permission of instructor

**M S E 697: Engineering Internship**

Cr. R. Repeatable. F.S.SS.

*Prereq:* Permission of department, graduate classification

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**M S E 699: Research**

Cr. arr. Repeatable.

## Mathematics (MATH)

**Any experimental courses offered by MATH can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**MATH 101: Orientation in Mathematics**

(1-0) Cr. 1. F.

A required orientation for all first-year and transfer students in mathematics. Provides information about campus resources and opportunities available to students, assists with transition to the University, and academic planning. Offered on a satisfactory/fail basis only. Offered on a satisfactory-fail basis only.

**MATH 104: Introduction to Probability**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment

Permutations, combinations, probability, expected value, and applications. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Either MATH 104 or MATH 150 may be counted toward graduation, but not both.

**MATH 105: Introduction to Mathematical Ideas**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment

Introduction to the use of basic mathematics to solve real-world problems in the areas of voting issues, measuring power in situations where people have different numbers of votes, apportionment, fair division, and elementary game theory. No prior background in politics or history is necessary for this course. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**MATH 139: College Algebra Supplement**

(1-0) Cr. 1. F.S.

*Prereq:* Satisfactory performance on placement assessment

Math concepts to provide supplemental assistance with course topics of MATH 140. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Offered on a satisfactory-fail basis only.

**MATH 140: College Algebra**

(3-1) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or concurrent enrollment in MATH 139

Coordinate geometry, quadratic and polynomial equations, functions, graphing, rational functions, exponential and logarithmic functions, inverse functions, quadratic inequalities, systems of linear equations. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**MATH 143: Preparation for Calculus**

(4-0) Cr. 4. F.S.

*Prereq:* Satisfactory performance on placement assessment or MATH 140

Preparation for MATH 160 or MATH 165. Functions, graphing, basic trigonometry, logarithms, exponentials. Emphasis on co-variational reasoning. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 143 and MATH 145 may count toward graduation.

**MATH 145: Applied Trigonometry**

(3-0) Cr. 3. F.S.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in MATH 140

Mathematical ideas regarding the conception of space. General trigonometry, with an emphasis on the calculation of lengths, areas, and angles. The Law of Sines and the Law of Cosines. Polar, cylindrical, and spherical coordinate systems. Conic sections and quadric surfaces. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 143 and MATH 145 may count toward graduation.

**MATH 149: Discrete Mathematics for Business and Social Sciences Supplement**

(1-0) Cr. 1. F.S.

*Prereq:* Satisfactory performance on placement assessment

Math concepts to provide supplemental assistance with course topics of MATH 150. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Offered on a satisfactory-fail basis only.

**MATH 150: Discrete Mathematics for Business and Social Sciences**

(2-1) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or concurrent enrollment in MATH 149

Linear equations and inequalities, matrix algebra, linear programming, discrete probability. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Either MATH 104 or MATH 150 may be counted toward graduation, but not both.

**MATH 151: Calculus for Business and Social Sciences**

(2-1) Cr. 3. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment

Differential calculus, applications to max-min problems, integral calculus and applications. Will not serve as prerequisite for MATH 265 or MATH 266. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151, MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.



**MATH 160: Survey of Calculus**

(4-0) Cr. 4. F.S.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in (MATH 140 or MATH 143)

Analytic geometry, derivatives and integrals of elementary functions, simple differential equations, and applications. Will not serve as a prerequisite for MATH 265 or MATH 266. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151, MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 165: Calculus I**

(4-0) Cr. 4. F.S.SS.

*Prereq:* Satisfactory performance on placement assessment or minimum of C- in MATH 143

Differential calculus, applications of the derivative, introduction to integral calculus. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151 or MATH 160 or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 166: Calculus II**

(4-0) Cr. 4. F.S.SS.

*Prereq:* Minimum of C- in MATH 165 or satisfactory performance on placement assessments

Integral calculus, applications of the integral, parametric curves and polar coordinates, power series and Taylor series. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151, MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 166H: Calculus II, Honors**

(4-0) Cr. 4. F.

*Prereq:* Minimum of C- in MATH 165 or satisfactory performance on placement assessments

Integral calculus, applications of the integral, parametric curves and polar coordinates, power series and Taylor series. Additional material of a theoretical, conceptual, computational, or modeling nature. Some of the work may require more ingenuity than is required for MATH 166. Preference will be given to students in the University Honors Program. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of MATH 151 or MATH 160, or the sequence MATH 165-MATH 166 may be counted towards graduation.

**MATH 195: Mathematics for Elementary Education I**

(2-2) Cr. 3. F.S.

*Prereq:* Satisfactory performance on placement assessment; Early or Elementary Education major

Whole number operations through analysis of properties, theoretical and hands-on models, mathematical analysis of elementary students' thinking; standard and non-standard algorithms; structure of the decimal system; linear measurement; two- and three-dimensional measurement, shapes and spatial sense; number theory; algebra as it relates to elementary curricula/teaching profession. Satisfactory placement scores can be found at <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Students in the College of Liberal Arts and Sciences may not count MATH 195 toward General Education Requirements.

**MATH 196: Mathematics for Elementary Education II**

(2-2) Cr. 3. F.S.

*Prereq:* Minimum of C- in MATH 195; Early or Elementary Education major

Integer, fraction and decimal operations through analysis of properties, theoretical and hands-on models, mathematical analysis of elementary students' thinking; standard and non-standard algorithms; continuation of two- and three-dimensional measurement, shapes and spatial sense; probability and statistics; proportional reasoning; algebra as it relates to elementary curricula/teaching profession.

**MATH 201: Introduction to Proofs**

(3-0) Cr. 3. F.S.

*Prereq:* MATH 166 or MATH 166H

Transition to advanced mathematics. Communicating mathematics. Logical arguments; techniques of proofs regarding sets, numbers (natural and real), functions, relations, and limits.

**MATH 202: Career Development in Math and Statistics**

(Cross-listed with STAT). Cr. 1. S.

Career development in the mathematics and statistics disciplines with an emphasis on contemporary social issues. Presentations by professionals in STEM fields about occupations, decision-making strategies, and career goal implementation; development of job searching, resume writing, negotiating, and interviewing techniques. Offered on a satisfactory-fail basis only.

**MATH 207: Matrices and Linear Algebra**

(3-0) Cr. 3. F.S.SS.

*Prereq:* MATH 166

Systems of linear equations, determinants, vector spaces, linear transformations, orthogonality, least-squares methods, eigenvalues and eigenvectors. Emphasis on applications and techniques. Only one of MATH 207 and MATH 317 may be counted toward graduation.

**MATH 230: Discrete Computational Structures**

(Cross-listed with COM S). (3-1) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in (COM S 227; MATH 165); ENGL 150*

Concepts in discrete mathematics as applied to computer science. Logic, set theory, functions, relations, cardinality of sets, combinatorics, graph theory and number theory. Proof techniques, induction and recursion.

**MATH 240: Mathematics of Investment and Credit**

(3-0) Cr. 3. F.S.

*Prereq: MATH 166*

Interest rates, time value of money, annuities. Loans, bonds, yield rates. Term structure of interest rates, asset and liability management. Duration, convexity, immunization.

**MATH 265: Calculus III**

(4-0) Cr. 4. F.S.SS.

*Prereq: Minimum of C- in MATH 166 or MATH 166H*

Geometry of space and vectors, multivariable differential calculus, multivariable integral calculus, vector calculus.

**MATH 265H: Calculus III, Honors**

(4-0) Cr. 4. F.S.

*Prereq: Permission of Instructor; minimum of C- in MATH 166 or MATH 166H*

Geometry of space and vectors, multivariable differential calculus, multivariable integral calculus, vector calculus. Additional material of a theoretical, conceptual, computational, or modeling nature. Some of the work may require more ingenuity than is required in MATH 265. Preference will be given to students in the University Honors Program.

**MATH 266: Elementary Differential Equations**

(3-0) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in MATH 166 or MATH 166H*

Solution methods for ordinary differential equations. First order equations, linear equations, constant coefficient equations. Eigenvalue methods for systems of first order linear equations. Introduction to stability and phase plane analysis. Credit for either MATH 267 or the MATH 266, 268 pair of courses, but not both, may be applied toward graduation. Credit for only one of the following courses may be applied toward graduation: MATH 267, MATH 266, MATH 269.

**MATH 267: Elementary Differential Equations and Laplace Transforms**

(4-0) Cr. 4. F.S.SS.

*Prereq: Minimum of C- in MATH 166 or MATH 166H*

Same as MATH 266 but also including Laplace transforms and power series solutions to ordinary differential equations. Credit for either MATH 267 or the MATH 266, 268 pair of courses, but not both, may be applied toward graduation. Credit for only one of the following courses may be applied toward graduation: MATH 267, MATH 266, MATH 269.

**MATH 268: Laplace Transforms**

(1-0) Cr. 1. F.S.SS.

*Prereq: MATH 266; Department Permission*

Laplace transforms and power series solutions to ordinary differential equations. Credit for either MATH 267 or the MATH 266, 268 pair of courses, but not both, may be applied toward graduation.

**MATH 269: Systems of Differential Equations**

(1-0) Cr. 1. F.S.SS.

*Prereq: Department Permission*

Systems portion of MATH 266 and MATH 267: Eigenvalue methods for systems of first order linear equations. Introduction to stability and phase plane analysis. For students supplementing transfer courses in differential equations in order to earn credit in MATH 266 or 267. Familiarity with ordinary differential equations of first and second order required. Students with credit in MATH 266 or MATH 267 may not earn credit in MATH 269.

**MATH 290: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Independent study.

**MATH 290H: Independent Study, Honors**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

Independent study.

**MATH 297: Intermediate Topics for School Mathematics**

(2-2) Cr. 3. F.

*Prereq: Minimum of C- in MATH 196; Early or Elementary Education major*

Mathematical reasoning and topics in Euclidean and non-Euclidean geometry, including transformations, congruence, and similarity; exploration of probability with simulations; linearity and connections to Calculus; fractals and fractal dimension.

**MATH 301: Abstract Algebra I**

(3-0) Cr. 3. F.S.

*Prereq: (MATH 166 or MATH 166H); MATH 317; minimum of C- in MATH 201*

Basic properties of integers, divisibility and unique factorization.

Polynomial rings over a field. Congruence. Introduction to abstract rings, homomorphisms, ideals. Roots and irreducibility of polynomials. Introduction to groups. Emphasis on proofs.

**MATH 304: Combinatorics**

(3-0) Cr. 3. F.

*Prereq: (MATH 166 or MATH 166H); (MATH 201 or COM S 230 or CPR E 310)*

Enumeration strategies involving permutations, combinations, partitions, binomial coefficients, inclusion-exclusion principle, recurrence relations, generating functions. Additional topics selected from probability, algebraic combinatorics, and applications.

**MATH 314: Graph Theory**

(3-0) Cr. 3. S.

*Prereq: (MATH 166 or MATH 166H); (MATH 201 or COM S 230 or CPR E 310)*

Structure and extremal properties of graphs. Topics are selected from: trees, networks, colorings, paths and cycles, connectivity, planarity, directed graphs, matchings, Ramsey theory, forbidden structures, enumeration, applications.

**MATH 317: Theory of Linear Algebra**

(4-0) Cr. 4. F.S.

*Prereq: Credit or concurrent enrollment in MATH 201 or COM S 230 or CPR E 310*

Systems of linear equations, determinants, vector spaces, inner product spaces, linear transformations, eigenvalues and eigenvectors. Emphasis on writing proofs and results. Only one of MATH 207 and MATH 317 may be counted toward graduation.

**MATH 341: Introduction to the Theory of Probability and Statistics I**

(Cross-listed with STAT). (3-2) Cr. 4. F.S.

*Prereq: MATH 265 or MATH 265H*

Probability; distribution functions and their properties; classical discrete and continuous distribution functions; multivariate probability distributions and their properties; moment generating functions; transformations of random variables; simulation of random variables and use of the R statistical package. Credit for only one of the following courses may be applied toward graduation: STAT 341, STAT 347, STAT 447, or STAT 588.

**MATH 342: Introduction to the Theory of Probability and Statistics II**

(Cross-listed with STAT). (3-2) Cr. 4. F.S.

*Prereq: (MATH 207 or MATH 317); (STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 226 or STAT 231 or STAT 305 or STAT 322 or STAT 330); STAT 341*

Sampling distributions; confidence intervals and hypothesis testing; theory of estimation and hypothesis tests; linear model theory; resampling methods; introduction to Bayesian inference; use of the R statistical package for simulation and data analysis.

**MATH 350: Number Theory**

(Cross-listed with COM S). (3-0) Cr. 3. S.

*Prereq: COM S 230 or CPR E 310 or MATH 201*

Divisibility, integer representations, primes and divisors, linear diophantine equations, congruences, and multiplicative functions. Applications to cryptography. Additional topics, chosen at the discretion of the instructor.

**MATH 365: Complex Variables with Applications**

(3-0) Cr. 3. S.

*Prereq: MATH 265*

Functions of a complex variable, including differentiation, integration, series, residues, and conformal mappings.

**MATH 373: Introduction to Scientific Computing**

(3-0) Cr. 3. F.

*Prereq: MATH 265*

Vector and matrix programming and graphing in MATLAB for scientific applications. Polynomial interpolation and approximation. Systems of linear equations and numerical linear algebra. Numerical differentiation and integration. Root-finding methods for solving nonlinear equations and optimization in one and several variables. Fast Fourier transform. Emphasis on effective use of mathematical software and understanding of its strengths and limitations.

**MATH 385: Introduction to Partial Differential Equations**

(3-0) Cr. 3. F.S.

*Prereq: MATH 265; (MATH 266 or MATH 267)*

Method of separation of variables for linear partial differential equations, including heat equation, Poisson equation, and wave equation. Topics from Fourier series, Sturm-Liouville theory, Bessel functions, spherical harmonics, and method of characteristics.

**MATH 397: Teaching Secondary Mathematics Using University Mathematics**

(2-2) Cr. 3. S.

*Prereq: MATH 201; MATH 301*

Coursework in university mathematics including calculus, abstract algebra, discrete mathematics, geometry, and other topics as it relates to teaching mathematics in grades 5-12.

**MATH 398: Cooperative Education**

Cr. R. Repeatable, maximum of 2 times. F.S.SS.

*Prereq: Junior classification; Permission of Department Cooperative Education Coordinator*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**MATH 403: Intermediate Abstract Algebra**

(Dual-listed with MATH 503). (3-0) Cr. 3. S.

*Prereq: 403: Minimum of C in MATH 301, 503: Not taken MATH 504 or MATH 505*

Properties of groups and rings, subgroups, ideals, and quotients, homomorphisms, structure theory for finite groups. PIDs, UFDs, and Euclidean Domains. Field extensions and finite fields. Selected applications.

**MATH 407: Applied Linear Algebra**

(Dual-listed with MATH 507). (3-0) Cr. 3. F.

*Prereq: MATH 317 or (MATH 207; MATH 201)*

Advanced topics in applied linear algebra including eigenvalues, eigenvalue localization, singular value decomposition, symmetric and Hermitian matrices, nonnegative and stochastic matrices, matrix norms, canonical forms, matrix functions. Applications to mathematical and physical sciences, engineering, and other fields.

**MATH 414: Analysis I**

(3-0) Cr. 3. F.S.SS.

*Prereq: Minimum of C- in COM S 230 or CPR E 310 or MATH 201*

A rigorous development of calculus of functions of one real variable: real number properties and topology, limits, continuity, differentiation, integration, series.

**MATH 415: Analysis II**

(3-0) Cr. 3. S.

*Prereq: MATH 265; (MATH 317 or MATH 407); MATH 414*

Sequences and series of functions of a real variable, uniform convergence, power series, metric spaces, calculus of functions of two or more real variables.

**MATH 421: Logic for Mathematics and Computer Science**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq: COM S 230 or CPR E 310 or MATH 207 or MATH 301 or MATH 317*

Propositional and predicate logic. Topics selected from Horn logic, equational logic, resolution and unification, foundations of logic programming, reasoning about programs, program specification and verification, model checking and binary decision diagrams, temporal logic and modal logic.

**MATH 423: Mathematical Modeling in Biology**

(Dual-listed with MATH 523). (3-0) Cr. 3. F.

*Prereq: MATH 266 or MATH 267*

Introduction to mathematical techniques for modeling and simulation, parameter identification, and analysis of biological systems. Applications drawn from many branches of biology and medicine. Apply differential equations, difference equations, and dynamical systems theory to a wide array of biological problems. MATH 265 or equivalent recommended.

**MATH 424: Introduction to High Performance Computing**

(Cross-listed with COM S, CPR E). (2-2) Cr. 3. F.

*Prereq: (MATH 265; [MATH 207 or MATH 317]) or Permission of Instructor* Unix, serial programming of scientific applications, OpenMP for shared-memory parallelization. No Unix, Fortran or C experience required.

**MATH 435: Geometry I**

(3-0) Cr. 3. F.

*Prereq: (COM S 230 or CPR E 310 or MATH 201); (MATH 207 or MATH 317)*

Euclidean geometry of triangles, circles, and parallelograms, studied from several points of view, chosen from: synthetic, analytic, axiomatic, transformational, complex numbers, or vector methods. Possible and impossible constructions with compass and straightedge.

**MATH 436: Geometry II**

(3-0) Cr. 3. S.

*Prereq: (COM S 230 or CPR E 310 or MATH 201); (MATH 207 or MATH 317)*

Foundations of Euclidean geometry and the axiomatic method, including the use of models. The history, logical consistency, and basic theorems of non-Euclidean geometries, such as hyperbolic, elliptic, and projective geometry.

**MATH 441: Life Contingencies I**

Cr. 3. F.

*Prereq: MATH 240; credit or concurrent enrollment in MATH 265*

Topics in life insurance for the Actuarial Sciences I: single life annuities, benefits premiums and reserves.

**MATH 442: Life Contingencies II**

Cr. 3. S.

*Prereq: MATH 441*

Topics in life insurance for the Actuarial Sciences II: multiple life functions, multiple decrement models, pension plan valuation, insurance models, applications.

**MATH 469: Introduction to Discrete Mathematics**

(Dual-listed with MATH 569). (3-0) Cr. 3. S.

*Prereq: (MATH 207 or MATH 317); (MATH 304 or MATH 314)*

Combinatorial counting, double-counting, generating functions, graph structure, planar graphs, probabilistic proofs, points in general positions, polytopes, Farkas lemma, linear programming and duality.

**MATH 481: Numerical Methods for Differential Equations**

(Dual-listed with MATH 581). (Cross-listed with COM S). (3-0) Cr. 3. S.

*Prereq: MATH 265; (MATH 266 or MATH 267)*

First order Euler method, high order Runge-Kutta methods, and multistep methods for solving ordinary differential equations. Finite difference and finite element methods for solving partial differential equations. Local truncation error, stability, and convergence for finite difference method. Numerical solution space, polynomial approximation, and error estimate for finite element method. Computer programming required.

**MATH 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

No more than 9 credits of Math 490 or Math 490H may be counted toward graduation.

**MATH 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

No more than 9 credits of Math 490 or 490H may be counted toward graduation.

**MATH 491: Undergraduate Thesis**

Cr. 2-3.

Writing and presenting a formal mathematics paper. Upon approval by the department, the paper will satisfy the departmental advanced English requirement.

**MATH 492: Undergraduate Seminar**

(2-0) Cr. 2. F.S.

*Prereq: MATH 317 or MATH 407*

Introduction to independent mathematical thought, with emphasis on oral communication of an advanced topic. Seminar content varies.

**MATH 495: Special Topics**

Cr. arr. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

Topics of current interest.

**MATH 497: Teaching Secondary School Mathematics**

(Cross-listed with EDUC). (3-0) Cr. 3. F.

*Prereq: 15 credits in college mathematics. Admitted to the Educator Preparation Program.*

Develop an understanding of instructional planning, lesson implementation, and assessment in grades 5-12 mathematics, with a focus on reform-based mathematics, equity, and conceptual understanding.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MATH 501: Introduction to Real Analysis**

(3-0) Cr. 3. F.

*Prereq: MATH 265 and (MATH 207 or MATH 317)*

A development of the real numbers. Study of metric spaces, completeness, compactness, sequences, and continuity of functions. Differentiation and integration of real-valued functions, sequences of functions, limits and convergence, equicontinuity.

**MATH 502: Topology**

(3-0) Cr. 3. S.

*Prereq: MATH 414 or MATH 501*

Introduction to general topology. Topological spaces, continuous functions, connectedness, compactness. Topics selected from countability and separation axioms, metrization, and complete metric spaces. Topics in algebraic topology.

**MATH 503: Intermediate Abstract Algebra**

(Dual-listed with MATH 403). (3-0) Cr. 3. S.

*Prereq: 403: Minimum of C in MATH 301, 503: Not taken MATH 504 or MATH 505*

Properties of groups and rings, subgroups, ideals, and quotients, homomorphisms, structure theory for finite groups. PIDs, UFDs, and Euclidean Domains. Field extensions and finite fields. Selected applications.

**MATH 504: Abstract Algebra I**

(3-0) Cr. 3. F.

*Prereq: MATH 302*

Algebraic systems and their morphisms, with emphasis on groups and rings.

**MATH 505: Abstract Algebra II**

(3-0) Cr. 3. S.

*Prereq: MATH 504*

Continuation of Math 504. Algebraic systems and their morphisms, with emphasis on modules and fields.

**MATH 507: Applied Linear Algebra**

(Dual-listed with MATH 407). (3-0) Cr. 3. F.

*Prereq: MATH 317 or (MATH 207; MATH 201)*

Advanced topics in applied linear algebra including eigenvalues, eigenvalue localization, singular value decomposition, symmetric and Hermitian matrices, nonnegative and stochastic matrices, matrix norms, canonical forms, matrix functions. Applications to mathematical and physical sciences, engineering, and other fields.

**MATH 510: Linear Algebra**

(3-0) Cr. 3. S.

*Prereq: MATH 317 or MATH 407 or (MATH 207 and one of MATH 301 or MATH 414)*

Advanced topics in linear algebra including canonical forms; unitary, normal, Hermitian and positive-definite matrices; variational characterizations of eigenvalues.

**MATH 511: Functions of a Single Complex Variable**

(3-0) Cr. 3. S.

*Prereq: MATH 414 or MATH 501*

Theory of analytic functions, integration, topology of the extended complex plane, singularities and residue theory, maximum principle, conformal mapping, meromorphic functions, argument principle.

**MATH 515: Real Analysis I**

(3-0) Cr. 3. F.

*Prereq: MATH 414 or MATH 501*

Lebesgue measure and Lebesgue integral, one variable differentiation theory, Fubini and Tonelli theorems in  $\mathbb{R}^n$ ,  $L_p$  spaces.

**MATH 516: Real Analysis II**

(3-0) Cr. 3. S.

*Prereq: MATH 515*

Metric spaces, topological spaces, compactness, abstract theory of measure and integral, differentiation of measures, Banach spaces.

**MATH 517: Finite Difference Methods**

(3-0) Cr. 3. S.

*Prereq: MATH 481 or MATH 561*

Finite difference methods for partial differential equations. Methods for elliptic equations; explicit and implicit methods for parabolic and hyperbolic equations; stability, accuracy, and convergence theory, including von Neumann analysis, modified equations, and the Courant-Friedrichs-Lewy condition.

**MATH 518: Mathematical Modeling and Differential Equations**

(3-0) Cr. 3. S.

*Prereq: MATH 414, MATH 415*

Basic theory of ordinary differential equations, existence and uniqueness theorems, linear systems, linearization and stability, mathematical models in biology and physics, modeling with ordinary and partial differential equations, dynamical systems techniques.

**MATH 519: Methods of Applied Mathematics I**

(3-0) Cr. 3. F.

*Prereq: MATH 414 or MATH 501*

Techniques of classical and functional analysis with applications to differential equations and integral equations. Vector spaces, metric spaces, Hilbert and Banach spaces, Sobolev spaces and other function spaces, contraction mapping theorem, distributions, Fourier series and Fourier transform.

**MATH 520: Methods of Applied Mathematics II**

(3-0) Cr. 3. S.

*Prereq: MATH 519*

Continuation of Math 519. Linear operators, spectral theory of differential and integral operators, Green's functions and boundary value problems, weak solutions of partial differential equations and variational methods, calculus in Banach spaces and applications.

**MATH 523: Mathematical Modeling in Biology**

(Dual-listed with MATH 423). (Cross-listed with BCB, BCBIO). (3-0) Cr. 3. F.

*Prereq: MATH 266 or MATH 267*

Introduction to mathematical techniques for modeling and simulation, parameter identification, and analysis of biological systems. Applications drawn from many branches of biology and medicine. Apply differential equations, difference equations, and dynamical systems theory to a wide array of biological problems. MATH 265 or equivalent recommended.

**MATH 525: Numerical Analysis of High Performance Computing**

(Cross-listed with COM S, CPR E). (3-0) Cr. 3. S.

*Prereq: CPR E 308 or MATH 481; experience in scientific programming; knowledge of FORTRAN or C*

Introduction to parallelization techniques and numerical methods for distributed memory high performance computers. A semester project in an area related to each student's research interests is required.

**MATH 533: Cryptography**

(Cross-listed with CPR E, CYBSC). (3-0) Cr. 3. S.

*Prereq: MATH 301 or CPR E 310 or COM S 230*

Basic concepts of secure communication, DES and AES, public-key cryptosystems, elliptic curves, hash algorithms, digital signatures, applications. Relevant material on number theory and finite fields.

**MATH 535: Steganography and Digital Image Forensics**

(Cross-listed with CPR E, CYBSC). (3-0) Cr. 3. S.

*Prereq: E E 524 or MATH 317 or MATH 407 or COM S 230*

Basic principles of covert communication, steganalysis, and forensic analysis for digital images. Steganographic security and capacity, matrix embedding, blind attacks, image forensic detection and device identification techniques. Related material on coding theory, statistics, image processing, pattern recognition.



**MATH 554: Stochastic Process Models**

(Cross-listed with STAT). (3-0) Cr. 3. F.

*Prereq: STAT 542*

Markov chains on discrete spaces in discrete and continuous time (random walks, Poisson processes, birth and death processes) and their long-term behavior. Optional topics may include branching processes, renewal theory, introduction to Brownian motion.

**MATH 557: Ordinary Differential Equations and Dynamical Systems**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: MATH 415 or MATH 501*

The initial-value problem, existence and uniqueness theorems, continuous dependence on parameters, linear systems, stability and asymptotic behavior of solutions, linearization, dynamical systems, bifurcations, and chaotic behavior.

**MATH 561: Numerical Analysis I**

(3-0) Cr. 3. F.

*Prereq: MATH 414 or MATH 501*

Approximation theory, including polynomial interpolation, spline interpolation and best approximation; numerical differentiation and integration; numerical methods for ordinary differential equations.

**MATH 562: Numerical Analysis II**

(3-0) Cr. 3. S.

*Prereq: MATH 317*

Numerical linear algebra including LU factorization, QR factorization, linear least squares, singular value decomposition, eigenvalue problems, and iterative methods for large linear systems.

**MATH 565: Continuous Optimization**

(3-0) Cr. 3. S.

*Prereq: MATH 265 and one of MATH 317, 507, 510*

Theory and methods for constrained and unconstrained optimization. Steepest-descent, conjugate gradient, Newton and quasi-Newton, line search and trust-region, first and second order necessary and sufficient conditions, linear, quadratic and general nonlinear programming.

**MATH 566: Discrete Optimization**

(3-0) Cr. 3. F.

*Prereq: MATH 317 or MATH 507 or MATH 510*

Algorithms for linear programming, integer and combinatorial optimization. Linear programming, duality theory, simplex algorithm; the solution of the shortest-path, minimum spanning tree, max-flow/min-cut, minimum cost flow, maximum matching, and traveling salesman problems; integer linear programming, branch-and-bound, local and global search algorithms; matroids and greedy algorithms.

**MATH 567: Graph Theory**

(3-0) Cr. 3. F.

*Prereq: MATH 317 or MATH 507 or MATH 510*

Structural theory of graphs. Topics include basic structures (trees, paths, cycles and matchings), networks, colorings, connectivity, topological graph theory, Ramsey and Turan theory, spectral graph theory, introduction to probabilistic methods.

**MATH 568: Enumerative Combinatorics and Ordered Sets**

(3-0) Cr. 3. S.

*Prereq: MATH 302 or MATH 504*

Enumeration methods. Generating functions and sieve methods. Partially ordered sets, lattices, and Moebius inversion. Extremal set theory.

**MATH 569: Introduction to Discrete Mathematics**

(Dual-listed with MATH 469). (3-0) Cr. 3. S.

*Prereq: (MATH 207 or MATH 317); (MATH 304 or MATH 314)*

Combinatorial counting, double-counting, generating functions, graph structure, planar graphs, probabilistic proofs, points in general positions, polytopes, Farkas lemma, linear programming and duality.

**MATH 577: Linear Systems**

(Cross-listed with AER E, E E, M E). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or MATH 415; and MATH 207*

Linear algebra review. Least square method and singular value decomposition. State space modeling of linear continuous-time systems. Solution of linear systems. Controllability and observability. Canonical description of linear equations. Stability of linear systems. State feedback and pole placements. Observer design for linear systems.

**MATH 578: Nonlinear Systems**

(Cross-listed with AER E, E E, M E). (3-0) Cr. 3. S.

*Prereq: E E 577*

Linear vs nonlinear systems. Phase plane analysis. Bifurcation and center manifold theory. Lyapunov stability. Absolute stability of feedback systems. Input-output stability. Passivity theory and feedback linearization. Nonlinear control design techniques.

**MATH 581: Numerical Methods for Differential Equations**

(Dual-listed with MATH 481). (3-0) Cr. 3. S.

*Prereq: MATH 265; (MATH 266 or MATH 267)*

First order Euler method, high order Runge-Kutta methods, and multistep methods for solving ordinary differential equations. Finite difference and finite element methods for solving partial differential equations. Local truncation error, stability, and convergence for finite difference method. Numerical solution space, polynomial approximation, and error estimate for finite element method. Computer programming required.

**MATH 590: Independent Study**

Cr. arr. Repeatable.

**MATH 591: Orientation for Mathematics Graduate Students I**

(0.5-0) Cr. 0.5. F.

Fall semester orientation seminar. Required for graduate students in Mathematics and Applied Mathematics. Topics include teaching at the university level and communication of mathematics. Offered on a satisfactory-fail basis only.

**MATH 592: Orientation for Mathematics Graduate Students II**

(0.5-0) Cr. 0.5. S.

Spring semester orientation seminar. Required for graduate students in Mathematics and Applied Mathematics. Topics include teaching at the university level and communication of mathematics. Offered on a satisfactory-fail basis only.

**MATH 595: Special Topics**

Cr. arr. Repeatable.

**MATH 599: Creative Component**

Cr. arr.

**Courses for graduate students:****MATH 601: Mathematical Logic**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 504*

Model theory of propositional and predicate logic, the Soundness Theorem, the Compactness Theorem, the Goedel-Henkin Completeness Theorem, the Incompleteness Theorem, computability theory. As time permits: modal and temporal logic, set theory (the continuum hypothesis). Emphasis on the relationship between 'provable' and 'true' and the relationship between 'computable' and 'definable'.

**MATH 603: Mathematical Logic II**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MATH 601*

Topics in model theory, computability theory, and set theory such as infinitary logic, non-standard models of arithmetic, ultraproducts, and independence results.

**MATH 605: Design Theory and Association Schemes**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MATH 504*

Combinatorial designs and algebraic codes. Construction methods including finite fields. Error-correcting codes. Adjacency matrices and algebraic combinatorics.

**MATH 608: Extremal Graph Theory**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MATH 567*

Study of extremal graph problems and methods. Topics include probabilistic methods, generalizations of Turan's theorem, Szemerédi's regularity lemma, random graph theory.

**MATH 610: Seminar**

Cr. arr.

**MATH 617: Category Theory**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MATH 504*

Categories and functors and their applications.

**MATH 618: Representation Theory**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MATH 504*

Representations of algebraic structures. Content varies by semester.

**MATH 619: Commutative Algebra**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 505.*

Detailed study of commutative rings with applications to number theory and algebraic geometry, including prime ideals, Going Up and Going Down theorems, exact sequences, Ext and Tor, modules of fractions, primary decomposition, rings of integers, dimension theory.

**MATH 620: Lie Algebras and Their Representations**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MATH 504; and MATH 507 or MATH 510*

Nilpotent and solvable Lie algebras. Root systems and the classification of finite-dimensional complex semi-simple Lie algebras. The universal enveloping algebra. Representation theory including Weyl's theorem, Verma modules, highest weight theory.

**MATH 624: Manifolds, Tensors and Differential Geometry**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MATH 501 or MATH 515*

Topics selected from: Geometry of curves and surfaces. Manifolds, coordinate systems. Tangent and cotangent vectors, vector fields. Tensors, differential forms, Riemannian metrics. Connections, covariant differentiation, curvature tensors. Applications to physics and engineering.

**MATH 631: Harmonic Analysis**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MATH 515*

Fourier Series on an interval, approximate identities and summation, Gibb's phenomenon, Fourier transform on the line, uncertainty principle. Additional topics may include distributions, Hardy-Littlewood maximal function, boundedness of singular integral operators, arithmetic combinatorics, wavelet theory.

**MATH 633: Functional Analysis**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 515*

Fundamental theory of normed linear spaces and algebras, such as topology and continuity, duality and spectral theory, emphasizing aspects that provide a framework for the study of the spectrum of an operator, analytic function theory, and modern operator theory.

**MATH 641: Foundations of Probability Theory**

(Cross-listed with STAT). (3-0) Cr. 3. F.

*Prereq: MATH 414 or MATH 501 or equivalent course.*

Sequences and set theory; Lebesgue measure, measurable functions. Absolute continuity of functions, integrability and the fundamental theorem of Lebesgue integration. General measure spaces, probability measure, extension theorem and construction of Lebesgue-Stieljes measures on Euclidean spaces. Measurable transformations and random variables, induced measures and probability distributions. General integration and expectation,  $L_p$ -spaces and integral inequalities. Uniform integrability and absolute continuity of measures. Probability densities and the Radon-Nikodym theorem. Product spaces and Fubini-Tonelli theorems.

**MATH 642: Advanced Probability Theory**

(Cross-listed with STAT). (3-0) Cr. 3. S.

*Prereq: STAT 641, or STAT 543 and MATH 515*

Probability spaces and random variables. Kolmogorov's consistency theorem. Independence, Borel-Cantelli lemmas and Kolmogorov's 0 - 1 Law. Types and characterizations of convergence for random variables. Sums of independent random variables, empirical distributions, weak and strong laws of large numbers. Convergence in distribution and its formulations, tightness, characteristic functions, central limit theorems and Lindeberg-Feller conditions. Conditional probability and expectation, discrete parameter martingales.

**MATH 645: Advanced Stochastic Processes**

(Cross-listed with STAT). (3-0) Cr. 3. S.

Weak convergence. Random walks and Brownian motion. Martingales. Stochastic integration and Ito's Formula. Stochastic differential equations and applications.

**MATH 646: Mathematical Modeling of Complex Physical Systems**

(Cross-listed with PHYS). (3-0) Cr. 3. S.

Modeling of the dynamics of complex systems on multiple scales: Classical and dissipative molecular dynamics, stochastic modeling and Monte-Carlo simulation; coarse grained nonlinear dynamics, interface propagation and spatial pattern formation.

**MATH 655: Partial Differential Equations I**

(3-0) Cr. 3. F.

*Prereq: MATH 515 or MATH 519*

Study of model problems of elliptic, parabolic and hyperbolic types, first order equations, conservation laws, transform methods, introduction to linear partial differential equations of arbitrary order, fundamental solutions.

**MATH 656: Partial Differential Equations II**

(3-0) Cr. 3. S.

*Prereq: MATH 655*

Sobolev spaces, general theory of second order linear elliptic, parabolic and hyperbolic partial differential equations, first order linear hyperbolic systems, variational methods, fixed point methods.

**MATH 666: Finite Element Methods**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: MATH 516 or MATH 520 or MATH 561 or MATH 656*

Weak and variational formulations of elliptic problems; weak derivatives and Sobolev spaces; Lax-Milgram theorem, Bramble-Hilbert lemma; examples of finite element spaces; polynomial approximation theory; error estimates for finite element methods; implementation issues; mixed finite element methods for Stokes problems; applications.

**MATH 667: Computational Methods for Hyperbolic Partial Differential Equations (PDE)**

Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MATH 561, MATH 562*

Mathematical theory of weak/entropy solutions of nonlinear hyperbolic conservation laws; shock speed and Riemann problems; numerical methods for scalar equations and systems including Euler equations; conservative methods; approximate Riemann solvers; total variation stability; DG method.

**MATH 680: Advanced Topics**

(3-0) Cr. 3. Repeatable.

**MATH 680A: Advanced Topics: Algebra**

(3-0) Cr. 3. Repeatable.

**MATH 680B: Advanced Topics: Analysis**

(3-0) Cr. 3. Repeatable.

**MATH 680C: Advanced Topics: Applied Mathematics**

(3-0) Cr. 3. Repeatable.

**MATH 680D: Advanced Topics: Combinatorics**

(3-0) Cr. 3. Repeatable.

**MATH 680E: Advanced Topics: Differential Equations**

(3-0) Cr. 3. Repeatable.

**MATH 680F: Advanced Topics: Linear Algebra**

(3-0) Cr. 3. Repeatable.

**MATH 680G: Advanced Topics: Logic and Foundations**

Cr. 3. Repeatable.

**MATH 680H: Advanced Topics: Number Theory**

(3-0) Cr. 3. Repeatable.

**MATH 680I: Advanced Topics: Numerical Analysis**

(3-0) Cr. 3. Repeatable.

**MATH 680J: Advanced Topics: Optimization**

(3-0) Cr. 3. Repeatable.

**MATH 680K: Advanced Topics: Probability**

(3-0) Cr. 3. Repeatable.

**MATH 680L: Advanced Topics: Topology**

(3-0) Cr. 3. Repeatable.

**MATH 699: Research**

Cr. arr. Repeatable.

## Mechanical Engineering (M E)

*Any experimental courses offered by M E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

### **M E 160: Mechanical Engineering Problem Solving with Computer Applications**

(2-2) Cr. 3. F.S.

*Prereq: (MATH 143 or MATH 145); credit or concurrent enrollment in MATH 165; M E major*

Introduction to the field of Mechanical Engineering through problem-solving in a range of topics including statics, mechanics of materials and thermo-fluids. Techniques to professionally present and communicate solutions. Use of MATLAB computer programming to aid problem solving, including curve fitting and graphing. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count toward graduation.

### **M E 170: Engineering Graphics and Introductory Design**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 143 or MATH 145 or satisfactory scores on mathematics placement assessments*

Integration of fundamental graphics, computer modeling, and engineering design. Applications of multiview drawings and dimensioning. Techniques for visualizing, analyzing, and communicating 3-D geometries. Application of the design process including written and oral reports. Freehand and computer methods. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>.

**M E 190: Learning Communities**

(1-0) Cr. 1. Repeatable. F.S.

Enrollment in M E learning communities.

**M E 202: Mechanical Engineering - Professional Planning**

Cr. R. F.S.

*Prereq: Credit or concurrent enrollment in M E 231*

Preparation for a career in mechanical engineering; discussion of opportunities for leadership, undergraduate research, experiential learning.

**M E 220: Globalization and Sustainability**

(Cross-listed with ANTHR, ENV S, GLOBE, MAT E, SOC). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**M E 231: Engineering Thermodynamics I**

(3-0) Cr. 3. F.S.SS.

*Prereq: CHEM 167; MATH 166; PHYS 231; PHYS 231L*

Fundamental concepts based on zeroth, first and second laws of thermodynamics. Properties and processes for ideal gases and solid-liquid-vapor phases of pure substances. Applications to vapor power cycles.

**M E 270: Introduction to Mechanical Engineering Design**

(1-6) Cr. 3. F.S.

*Prereq: M E 160 or (A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, ENGR 160, I E 148, or S E 185); M E 170; PHYS 231; PHYS 231L*

Overview of mechanical engineering design with applications to thermal and mechanical systems. Introduction to current design practices used in industry. Semester-long team project focused on addressing societal needs. Past projects include designing human powered charging systems and products for developing nations.

**M E 324: Manufacturing Engineering**

(3-0) Cr. 3. F.S.SS.

*Prereq: E M 324; MAT E 273; M E 270; M E 324L*

Fundamentals of manufacturing processes including forming, machining, casting and welding with emphasis on design considerations in manufacturing. Mechanical behavior of metallic materials. Modern manufacturing practices.

**M E 324L: Manufacturing Engineering Laboratory**

(0-2) Cr. 1. F.S.SS.

*Prereq: ENGL 250; MAT E 273; M E 270*

Laboratory exercises in metrology, mechanical testing (tensile/compression and hardness tests), computer aided design (CAD), machining operations, metal welding, metal casting, and bulk/sheet metal forming.

**M E 325: Mechanical Component Design**

(3-0) Cr. 3. F.S.SS.

*Prereq: E M 324; M E 170; STAT 305*

Philosophy of design and design methodology. Consideration of stresses and failure models useful for static and fatigue loading. Analysis, selection and synthesis of machine elements.

**M E 332: Engineering Thermodynamics II**

(3-0) Cr. 3. F.S.SS.

*Prereq: M E 231*

Gas power cycles. Fundamentals of gas mixtures, psychrometry, and thermochemistry. Applications to one-dimensional compressible flow, refrigeration, air conditioning and combustion processes.

**M E 335: Fluid Flow**

(3-2) Cr. 4. F.S.SS.

*Prereq: MATH 265; (MATH 266 or MATH 267); (credit or concurrent enrollment in M E 332); M E 345*

Incompressible and compressible fluid flow fundamentals. Dimensional analysis and similitude. Internal and external flow applications. Lab experiments emphasizing concepts in thermodynamics and fluid flow. Written reports are required.

**M E 345: Engineering Dynamics**

(3-0) Cr. 3. F.S.SS.

*Prereq: C E 274; credit or concurrent enrollment in (MATH 266 or MATH 267)*

Particle and rigid body kinematics, Newton's laws of motion, kinetics of plane motion, rigid body problems using work-energy, linear, and angular impulse-momentum principles, vibrations.

**M E 370: Engineering Measurements**

(2-3) Cr. 3. F.S.SS.

*Prereq: E E 442; STAT 305*

Fundamentals of design, selection, and operation of components of measuring systems. Measurement processes, data acquisition systems, analysis of data, and propagation of measurement uncertainty.

**M E 401: Human Centered Design, Pre-Departure Course.**

Cr. 1. Alt. S., offered irregularly.

*Prereq: Acceptance into Study Abroad Program.*

A pre-departure course for M E 402. Safety and health issues while on site; travel logistics; required travel documents and deadlines; cultural norms. Offered on a satisfactory-fail basis only.

**M E 402: Field Engineering: Human Centered Design Concepts.**

(1-4) Cr. 3. Alt. SS., offered irregularly.

*Prereq: M E 401*

Design methodology and field engineering principles for use in engineering problem solving in developing nations; application of principals will be on site. Awareness of culture, use of local artisans, crafts people and engineers will be emphasized for the purpose of ensuring sustainable and appropriate technology.

Meets International Perspectives Requirement.

**M E 410: Mechanical Engineering Applications of Mechatronics**

(2-2) Cr. 3. Alt. S., offered irregularly.

*Prereq: E E 442; E E 448; credit or concurrent enrollment in M E 421*

Fundamentals of sensor characterization, signal conditioning and motion control, coupled with concepts of embedded computer control. Digital and analog components used for interfacing with computer controlled systems. Mechanical system analysis combined with various control approaches. Focus on automation of hydraulic actuation processes. Laboratory experiences provide hands-on development of mechanical systems.

**M E 411: Automatic Controls**

(2-2) Cr. 3. F.

*Prereq: M E 370; credit or concurrent enrollment in M E 421*

Methods and principles of automatic control. Pneumatic, hydraulic, and electrical systems. Representative applications of automatic control systems. Mathematical analysis of control systems.

**M E 412: Ethical Responsibilities of a Practicing Engineer**

(3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in M E 325*

The study of ethics in engineering design and the engineering profession. A comprehensive look at when ethical decisions must be made and an approach to make them. The approach takes into account moral, legal, technical, experiential, and standards to aid in ethical decision making. Each area will be studied through lectures, debates, guest speakers, class discussion, and case studies.

**M E 413: Fluid Power Engineering**

(Cross-listed with A B E). (2-2) Cr. 3. F.

*Prereq:* Credit or concurrent enrollment in (A B E 378 or M E 335); (A B E 216 or M E 270)

Fundamental fluid power principles, symbols and schematics. Hydraulic fluid properties. Function and performance of components such as connections and fittings, filtration, pumps, valves, actuators, hydrostatic transmissions. Hydraulic system dynamics. Modeling and simulation of circuits. Analysis and design of hydraulic systems. Hydrostatic transmission design. Hands-on construction of circuits, measurement of system variables, and electrohydraulic control.

**M E 415: Mechanical Systems Design**

(0-6) Cr. 3. F.S.

*Prereq:* M E 324; M E 325

Mechanical Engineering Capstone Design course. Team approach to solving design problems involving mechanical systems. Teams will use current design practices they will encounter in industry. Document decisions concerning form and function, material specification, manufacturing methods, safety, cost, and conformance with codes and standards. Solution description includes oral and written reports. Projects often worked with industry sponsors.

**M E 416: Mechanism Design and Analysis**

Cr. 3. S.

*Prereq:* M E 325

An introduction to the design and analysis of mechanisms and the use of prescribed design methodologies to identify design requirements and achieve desired motion profiles. Topics include fundamental mechanism kinematics; graphical and analytical mechanism synthesis methods; velocity and acceleration analysis; and the design of linkages, cams and gear trains. Significant amount of team-based problem solving and the development of physical and computational models to assist in the design process.

**M E 417: Advanced Machine Design**

(Dual-listed with M E 517). (3-0) Cr. 3. F.

*Prereq:* M A T E 273; M E 325

Stress life, strain life, and fracture mechanics approaches to fatigue life and design with metals, polymers and ceramics. Introduction to material selection in design of machine components. Thermal and structural considerations in design of machine components and hybrid materials. Course project and relevant literature review required for graduate credit.

**M E 418: Mechanical Considerations in Robotics**

(Dual-listed with M E 518). (3-0) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in M E 421

Three dimensional kinematics, dynamics, and control of robot manipulators, hardware elements and sensors. Laboratory experiments using industrial robots.

**M E 419: Computer-Aided Design**

(3-0) Cr. 3. F.S.

*Prereq:* M E 325

Theory and applications of computer-aided design. Computer graphics programming, solid modeling, assembly modeling, and finite element modeling. Mechanical simulation, process engineering, rapid prototyping and manufacturing integration.

**M E 421: System Dynamics and Control**

(3-2) Cr. 4. F.S.SS.

*Prereq:* E E 442; E E 448; MATH 267; M E 345

Modeling and simulation of mechanical, electrical, fluid, and/or thermal systems. Development of equations of motion and dynamic response characteristics in time and frequency domains. Fundamentals of classical control applications, including mathematical analysis and design for closed loop control systems. Introduction to computer interfacing for simulation, data acquisition, and control. Laboratory exercises for hands-on system investigation and control implementation.

**M E 425: Optimization Methods for Complex Designs**

(Dual-listed with M E 525). (3-0) Cr. 3. F.

*Prereq:* MATH 265; M E 160

Optimization involves finding the 'best' according to specified criteria. Review of a range of optimization methods from traditional nonlinear to modern evolutionary methods such as Genetic algorithms. Examination of how these methods can be used to solve a wide variety of design problems across disciplines, including mechanical systems design, biomedical device design, biomedical imaging, and interaction with digital medical data. Students will gain knowledge of numerical optimization algorithms and sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Experience includes code writing and off-the-shelf routines. Numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques.

**M E 427: Vehicle Dynamics and Suspension Design**

(3-0) Cr. 3. S.

*Prereq:* M E 345

Analysis and evaluation of the performance of cars, trucks and other surface vehicles. Computer simulation of ride, braking, and directional response. Considerations in the design and fabrication of suspension systems.



**M E 433: Alternative Energy**

(3-0) Cr. 3. F.

*Prereq: CHEM 167; PHYS 232; PHYS 232L*

Basic principles, performance, and cost analysis of alternative energy systems including biofuels, bioenergy, wind, solar, fuel cells, storage and other alternative energy systems. Performance analysis and operating principles of systems and components, and economic analysis for system design and operation will be taught. Emphasis is on alternative energy technologies needed to meet our future energy needs at various scales ranging from household to city to national levels.

**M E 436: Heat Transfer**

(3-2) Cr. 4. F.S.SS.

*Prereq: M E 335*

Heat transfer by conduction, convection, and radiation. Similarity concepts in heat, mass, and momentum transfer. Methods for determination of heat transfer coefficients. Combined modes of heat transfer. Heat exchangers. Lab experiments emphasizing concepts in thermodynamics and heat transfer. Written reports are required.

**M E 437: Introduction to Combustion Engineering**

(3-0) Cr. 3. S.

*Prereq: M E 332*

Introduction to the fundamentals of combustion and the analysis of combustion systems for gaseous, liquid, and solid fuels-including biomass fuels. Combustion fundamentals are applied to the analysis of engines; turbines, biomass cookstoves; suspension, fixed-bed, and fluidized-bed furnaces; and other combustion devices.

**M E 441: Fundamentals of Heating, Ventilating, and Air Conditioning**

(3-0) Cr. 3. F.

*Prereq: M E 332*

Space conditioning and moist air processes. Application of thermodynamics, heat transfer, and fluid flow principles to the analysis of heating, ventilating, and air conditioning components and systems. Performance and specification of components and systems.

**M E 442: Heating and Air Conditioning Design**

(1-5) Cr. 3. S.

*Prereq: (M E 441; credit or concurrent enrollment in M E 436) or Permission of Instructor*

Design criteria and assessment of building environment and energy requirements. Design of heating, ventilating, and air conditioning systems. System control and economic analysis. Oral and written reports required.

**M E 444: Elements and Performance of Power Plants**

(3-0) Cr. 3. S.

*Prereq: M E 332; credit or concurrent enrollment in M E 335*

Basic principles, thermodynamics, engineering analysis of power plant systems. Topics include existing power plant technologies, the advanced energyplex systems of the future, societal impacts of power production, and environmental and regulatory concerns.

**M E 448: Fluid Dynamics of Turbomachinery**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: AER E 311 or M E 335*

Applications of principles of fluid mechanics and thermodynamics in performance analysis and design of turbomachines. Conceptual and preliminary design of axial and radial flow compressors and turbines using velocity triangles and through-flow approaches.

**M E 449: Internal Combustion Engines**

(3-1) Cr. 3. F.

*Prereq: M E 332*

Basic principles, thermodynamics, combustion, and exhaust emissions of spark-ignition and compression-ignition engines. Laboratory determination of fuel properties and engine performance. Effects of engine components and operating conditions on performance. Written reports required.

**M E 451: Engineering Acoustics**

(Cross-listed with E E, E M). (2-2) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: (MATH 266 or MATH 267); PHYS 231; PHYS 231L*

The basics of acoustic wave propagation in fluids with an emphasis on sound propagation in air. Topics include transmission and reflection of sound at a boundary; role of acoustic sources in directing sound fields; diffraction of sound around solid objects; reverberation of sound in a room; and the measurement of sound fields.

**M E 456: Machine Vision**

(Dual-listed with M E 556). Cr. 3. Repeatable. Alt. F., offered odd-numbered years.

*Prereq: MATH 207 or MATH 317 or Permission of Instructor*

Practical imaging processing techniques, geometric optics, and mathematics behind machine vision, as well as the most advanced 3D vision techniques. Experience with practical vision system development and analysis. Assignments include individual bi-weekly homework; weekly readings and lectures; and a semester-long research project on design and experiment vision systems.

**M E 475: Modeling and Simulation**

(3-0) Cr. 3. S.

*Prereq: M E 421; credit or concurrent enrollment in M E 436*

Introduction to computer solution techniques required to simulate flow, thermal, and mechanical systems. Methods of solving ordinary and partial differential equations and systems of algebraic equations; interpolation, numerical integration; finite difference and finite element methods.

**M E 484: Technology, Globalization and Culture**

(Dual-listed with M E 584). (Cross-listed with MKT, WLC). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**M E 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Investigation of topics holding special interest of students and faculty. Election of course and topic must be approved in advance by supervising faculty.

**M E 490H: Independent Study: Honors**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Investigation of topics holding special interest of students and faculty. Election of course and topic must be approved in advance by supervising faculty.

**M E 490N: Independent Study: Non Technical Elective**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Investigation of topics holding special interest of students and faculty. Election of course and topic must be approved in advance by supervising faculty.

**M E 490T: Independent Study: Technical Elective**

Cr. 1-6. Repeatable.

*Prereq: Permission of Instructor*

Investigation of topics holding special interest of students and faculty. Election of course and topic must be approved in advance by supervising faculty.

**Courses primarily for graduate students, open to qualified undergraduates:**

**M E 501: Fundamentals of Biorenewable Resources**

(3-0) Cr. 3. S.

*Prereq: Previous coursework in introductory physics and chemistry is recommended.*

Introduction to the science and engineering of converting biorenewable resources into bioenergy and biobased products. Survey of biorenewable resource base and properties; description of biofuels and biobased products; production of biorenewable resources; processing technologies for fuels, chemicals, materials, and energy; environmental impacts; technoeconomic analysis of production and processing; and biofuels policy.

**M E 502: Microfluidics and Nanofluidics: Theory, Design and Devices**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: M E 436 (Heat Transfer) or an undergraduate class on transport phenomena, or Instructor's permission*

Analysis of transport phenomena and its application to the field of microfluidics. Conservation equations of mass, momentum and energy are derived from first principles and applied to contemporary topics in microfluidics such as organs-on-a-chip, point-of-care and separation processes. The conservation equations are used to model hydrodynamics and random walk diffusion of multiphase microfluidic systems. Advanced microfluidic topics, such as interfacial transport involving capillary interactions, electrostatic forces, and chemical gradients are discussed into order to describe a variety of phenomena observed in microfluidic devices. Numerical models based on finite element modeling and molecular dynamic simulation techniques are discussed as one approach to designing microfluidic devices such as pumps, micromixers, actuators, and filters.

**M E 510: Economics and Policy of Engineered Energy Systems**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Senior classification or graduate standing*

Economics and policy for U.S. energy systems, with an emphasis on connections to engineering. Topics include: economic analysis of conventional energy commodity markets and technologies, deregulated electricity markets, and emerging energy technologies; demand forecasting; economic and environmental policy in energy; integrated assessment; and semester-specific contemporary issues. Economics majors may not apply this course towards graduation.

**M E 511: Advanced Control Design**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 411*

Application of control design methods using continuous, discrete, and frequency-based models. Approaches include classical, pole assignment, model reference, internal model, and adaptive control methods. Mechanical design projects.

**M E 517: Advanced Machine Design**

(Dual-listed with M E 417). (3-0) Cr. 3. S.

*Prereq: M A T E 273; M E 325*

Stress life, strain life, and fracture mechanics approaches to fatigue life and design with metals, polymers and ceramics. Introduction to material selection in design of machine components. Thermal and structural considerations in design of machine components and hybrid materials. Course project and relevant literature review required for graduate credit.

**M E 518: Mechanical Considerations in Robotics**

(Dual-listed with M E 418). (3-0) Cr. 3. S.

*Prereq: Credit or concurrent enrollment in M E 421*

Three dimensional kinematics, dynamics, and control of robot manipulators, hardware elements and sensors. Laboratory experiments using industrial robots.

**M E 520: Material and Manufacturing Considerations in Design**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: M E 324, M E 325*

Integration of materials, design and manufacturing. Materials selection. Design for assembly and manufacturing (DFMA). Design and redesign to facilitate cost-effective manufacturing using material selection and DFMA software.

**M E 521: Mechanical Behavior and Manufacturing of Polymers and Composites**

(Cross-listed with M S E). (3-0) Cr. 3. S.

*Prereq: M E 324, E M 324*

Effect of chemical structure and morphology on properties. Linear viscoelasticity, damping and stress relaxation phenomena. Structure and mechanics of filler and fiber reinforced composites. Mechanical properties and failure mechanisms. Material selection and designing with polymers. Processing of polymer and composite parts.

**M E 525: Optimization Methods for Complex Designs**

(Dual-listed with M E 425). (3-0) Cr. 3. F.

*Prereq: M A T H 265; M E 160*

Optimization involves finding the 'best' according to specified criteria. Review of a range of optimization methods from traditional nonlinear to modern evolutionary methods such as Genetic algorithms. Examination of how these methods can be used to solve a wide variety of design problems across disciplines, including mechanical systems design, biomedical device design, biomedical imaging, and interaction with digital medical data. Students will gain knowledge of numerical optimization algorithms and sufficient understanding of the strengths and weaknesses of these algorithms to apply them appropriately in engineering design. Experience includes code writing and off-the-shelf routines. Numerous case-studies of real-world situations in which problems were modeled and solved using advanced optimization techniques.

**M E 527: Mechanics of Machining and Finishing Processes**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: M E 324*

Mechanics of material removal for ductile materials. Shear zone theory. Oblique cutting. Heat transfer in machining. Milling and grinding. Mechanics of material removal for brittle materials. Optimal selection and design of cutting parameters. Control of machining processes. Principles of precision finishing. Design considerations for machining and finishing processes.

**M E 528: Micro/Nanomanufacturing**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 324*

Concepts and applications of micro/nanotechnology appropriate to the manufacturing field. An overview of micro/nano-fabrication techniques including mechanical, EDM, laser and lithography. MEMS device fabrication. Scaling laws. Top down and bottom up approaches of nanomanufacturing. Experimental or theoretical project leading to potential submission of a manuscript for journal or conference.

**M E 530: Advanced Thermodynamics**

(3-0) Cr. 3. F.

*Prereq: M E 332*

Fundamentals of thermodynamics from the classical viewpoint with emphasis on the use of the first and second laws for analysis of thermal systems. Generalized thermodynamic relationships. Computer applications of thermodynamic properties and system analysis. Selected topics.

**M E 531: Advanced Energy Systems and Analysis**

Cr. 3. S.

*Prereq: M E 231 or M E 332 or graduate standing or instructor permission*

Introduction to energy systems including economic and thermodynamic principles. Various production systems will be analyzed. Application to transportation and building systems will be emphasized. Sustainability, climate change and other current energy system topics.

**M E 532: Compressible Fluid Flow**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: AER E 310, 311 or equivalent*

Thermodynamics of compressible flow. Viscous and inviscid compressible flow equations. One dimensional steady flow; isentropic flow, shocks, expansions. Multidimensional compressible flow aspects. Linear and nonlinear wave analysis and method of characteristics. Subsonic, transonic, supersonic and hypersonic flows.

**M E 534: Energetic Materials Combustion and Systems**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: M E 231; MATH 267; M E 335 or AER E 310 Recommend: M E 436; AER E 311; M E 437 or M E 542*

Introduction to energetic materials (classes of energetics, their use, safety, analysis of multiphase deflagration/detonation reaction wave structures), their application (e.g. pyrotechnics, chemical propulsion systems, explosives), system performance analysis, common measurement techniques, and societal/environmental implications.

**M E 535: Thermochemical Processing of Biomass**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 332 or graduate status*

Introduction to thermal and catalytic processes for the conversion of biomass to biofuels and other biobased products. Topics include gasification, fast pyrolysis, hydrothermal processing, syngas to synfuels, and bio-oil upgrading. Application of thermodynamics, heat transfer, and fluid dynamics to bioenergy and biofuels.

**M E 536: Advanced Heat Transfer**

(3-0) Cr. 3. S.

*Prereq: M E 436*

Advanced treatment of heat transmission by conduction, convection, and radiation.

**M E 538: Advanced Fluid Flow**

(3-0) Cr. 3. F.

*Prereq: Credit or enrollment in M E 436*

Detailed analysis of incompressible/compressible, viscous/inviscid, laminar/turbulent, and developing fluid flows on a particle/point control volume basis.

**M E 542: Advanced Combustion**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 332 or CH E 381*

Thermochemistry and transport theory applied to combustion. Gas phase equilibrium. Energy balances. Reaction kinetics. Flame temperatures, speed, ignition, and extinction. Premixed and diffusion flames. Combustion aerodynamics. Mechanisms of air pollution.

**M E 543: Introduction to Random Vibrations and Nonlinear Dynamics**

(Cross-listed with E M). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

Vibrations of continuous systems. Nonlinear vibration phenomena, perturbation expansions; methods of multiple time scales and slowly-varying amplitude and phase. Characteristics of random vibrations; random processes, probability distributions, spectral density and its significance, the normal or Gaussian random process. Transmission of random vibration, response of simple single and two-degree-of-freedom systems to stationary random excitation. Fatigue failure due to random excitation.

**M E 545: Thermal Systems Design**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: M E 436*

Integrating thermodynamics, fluid mechanics, and heat transfer to model thermal equipment and to simulate thermal systems. Second law and parametric analysis; cost estimation, life cycle analysis and optimization. Some computer programming required.

**M E 546: Computational Fluid Mechanics and Heat Transfer I**

(Cross-listed with AER E). (3-0) Cr. 3. F.

*Prereq: AER E 310 or M E 335, and programming experience*

Basic concepts of discretization, consistency, and stability. Explicit and implicit methods for ordinary differential equations. Methods for each type of partial differential equation. Iterative solution methods; curvilinear grids. Students will program basic algorithms.

**M E 547: Computational Fluid Mechanics and Heat Transfer II**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: AER E 546 or equivalent*

Application of computational methods to current problems in fluid mechanics and heat transfer. Methods for solving the Navier-Stokes and reduced equation sets such as the Euler, boundary layer, and parabolized forms of the conservation equations. Introduction to relevant aspects of grid generation and turbulence modeling.

**M E 548: Fundamentals of Laser and Optical Measurements in Thermofluid Systems**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* Undergraduate thermodynamics, undergraduate fluid dynamics, multivariable calculus, differential equations, electricity and magnetism

Fundamentals of lasers and optical techniques for application in measurements of thermo-fluid systems. Rigorous diffraction theory, theory of laser operation, and applications of theory to measurements using optics and lasers will be covered. The principles of measurement using linear scattering techniques (absorption, Rayleigh and Raman scattering) as well as nonlinear techniques (CARS and multiphoton absorption) will be discussed.

**M E 550: Advanced Biosensors: Fundamentals and Applications**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* Graduate status or Advanced undergraduates (junior or senior).  
*Recommend a basic background in engineering and one or more introductory biology courses.*

Extensive overview of biosensors including biological/biomedical microelectromechanical (Bio-MEMs) systems and bioanalytical devices with an introduction to fundamental principles, detection methods, and miniaturization techniques. Fundamental biosensor theory including biorecognition, transduction, signal acquisition, and post processing/ data analysis will be discussed. Distinct sensing modalities (e.g., electrochemical, optical, thermal and mass based), biorecognition agents (e.g., enzymes, antibodies, aptamers, whole cells/tissues, genetically engineered proteins) and advanced transduction materials (e.g., carbon nanotubes, graphene, quantum/carbon dots, and polymers/hydrogels) and their use in the context of specific applications (e.g., biomedical, environmental, food safety) will be reviewed in detail. Additionally, students will design a theoretical biosensor and present their design in a written proposal and oral presentation.

**M E 556: Machine Vision**

(Dual-listed with M E 456). Cr. 3. Repeatable. Alt. F., offered odd-numbered years.

*Prereq:* MATH 207 or MATH 317 or Permission of Instructor

Practical imaging processing techniques, geometric optics, and mathematics behind machine vision, as well as the most advanced 3D vision techniques. Experience with practical vision system development and analysis. Assignments include individual bi-weekly homework; weekly readings and lectures; and a semester-long research project on design and experiment vision systems.

**M E 557: Computer Graphics and Geometric Modeling**

(Cross-listed with COM S, CPR E). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* M E 421 or instructor permission

Fundamentals of computer graphics technology. Data structures. Parametric curve and surface modeling. Solid model representations. Applications in engineering design, analysis, and manufacturing.

**M E 561: Scanning Probe Microscopy**

(2-2) Cr. 3. Alt. F., offered irregularly.

*Prereq:* CHEM 167 (or equivalent), PHYS 231, PHYS 231L

Introduction to the scanning probe microscope (SPM, also known as atomic force microscope or AFM) and associated measurement techniques. Overview of instrumentation system, basic principles of operation, probe-sample interaction and various operational modes to obtain micro/nanoscale structure and force spectroscopy of material surfaces. Examples of SPM significance and applications in science and engineering research, nanotechnology and other industries. Laboratory work involving use of a scanning probe microscope system is an integral part of the course.

**M E 563: Micro and Nanoscale Mechanics**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* E M 324 and M E 325

Review of Fundamentals: (Elasticity, Electromagnetism, Mechanical response), Mechanics of thermally, electrostatically and magnetically actuated microsystems, Mechanics and design of nanostructured materials, mechanics of surface stress engineering and its implications to sensors and thin film structures.

**M E 564: Fracture and Fatigue**

(Cross-listed with AER E, E M, M S E). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* E M 324 and either MAT E 216 or MAT E 273 or MAT E 392.

*Undergraduates:* Permission of instructor

Materials and mechanics approach to fracture and fatigue. Fracture mechanics, brittle and ductile fracture, fracture and fatigue characteristics, fracture of thin films and layered structures. Fracture and fatigue tests, mechanics and materials designed to avoid fracture or fatigue.

**M E 566: Phase Transformation in Elastic Materials**

(Cross-listed with E M). (3-0) Cr. 3. S.

*Prereq:* EM 510 or EM 516 or EM 514

Continuum thermodynamics and kinetics approaches to phase transformations. Phase field approach to stress- and temperature-induced martensitic transformations and twinning at the nanoscale. Nucleation and growth. Nanostructural evaluation. Analytical and numerical solutions. Surface stresses and energy. Surface-induced phase transformations. Large Strain formulation.

**M E 570: Solid Modeling and GPU Computing**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: M E 170 and M E 419, or Instructor Permission*

Theory and applications of solid modeling and introduction to parallel computing using the graphic processing unit (GPU). Topics include solid modeling fundamentals, representations of solid geometry, introduction to parallel programming using CUDA, and applications of GPU algorithms. Design and analysis software include SolidWorks and programming using either C or Python, and NVIDIA CUDA.

**M E 573: Random Signal Analysis and Kalman Filtering**

(Cross-listed with AER E, E E). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or M E 370 or M E 411 or MATH 341*

Elementary notions of probability. Random processes. Autocorrelation and spectral functions. Estimation of spectrum from finite data. Response of linear systems to random inputs. Discrete and continuous Kalman filter theory and applications. Smoothing and prediction. Linearization of nonlinear dynamics.

**M E 574: Optimal Control**

(Cross-listed with AER E, E E). (3-0) Cr. 3. S.

*Prereq: E E 577*

The optimal control problem. Variational approach. Pontryagin's principle, Hamilton-Jacobi equation. Dynamic programming. Time-optimal, minimum fuel, minimum energy control systems. The regulator problem. Structures and properties of optimal controls.

**M E 575: Introduction to Robust Control**

(Cross-listed with AER E, E E). (3-0) Cr. 3.

*Prereq: E E 577*

Introduction to modern robust control. Model and signal uncertainty in control systems. Uncertainty description. Stability and performance robustness to uncertainty. Solutions to the H<sub>2</sub>, H<sub>∞</sub>, and I<sub>1</sub> control problems. Tools for robustness analysis and synthesis.

**M E 576: Digital Feedback Control Systems**

(Cross-listed with AER E, E E). (3-0) Cr. 3. F.

*Prereq: E E 475 or AER E 432 or M E 411 or MATH 415; and MATH 267*

Sampled data, discrete data, and the z-transform. Design of digital control systems using transform methods: root locus, frequency response and direct design methods. Design using state-space methods. Controllability, observability, pole placement, state estimators. Digital filters in control systems. Microcomputer implementation of digital filters. Finite wordlength effects. Linear quadratic optimal control in digital control systems. Simulation of digital control systems.

**M E 577: Linear Systems**

(Cross-listed with AER E, E E, MATH). (3-0) Cr. 3. F.

*Prereq: E E 324 or AER E 331 or MATH 415; and MATH 207*

Linear algebra review. Least square method and singular value decomposition. State space modeling of linear continuous-time systems. Solution of linear systems. Controllability and observability. Canonical description of linear equations. Stability of linear systems. State feedback and pole placements. Observer design for linear systems.

**M E 578: Nonlinear Systems**

(Cross-listed with AER E, E E, MATH). (3-0) Cr. 3. S.

*Prereq: E E 577*

Linear vs nonlinear systems. Phase plane analysis. Bifurcation and center manifold theory. Lyapunov stability. Absolute stability of feedback systems. Input-output stability. Passivity theory and feedback linearization. Nonlinear control design techniques.

**M E 580: Virtual Environments, Virtual Worlds, and Application**

(Cross-listed with HCI). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Senior or Graduate status.*

A systematic introduction to the underpinnings of Virtual Environments (VE), Virtual Worlds, advanced displays and immersive technologies; and an overview of some of the applications areas particularly virtual engineering.

**M E 584: Technology, Globalization and Culture**

(Dual-listed with M E 484). (Cross-listed with MKT, WLC). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**M E 585: Fundamentals of Predictive Plant Phenomics**

(Cross-listed with BCB, GDCB). Cr. 4. F.

Principles of engineering, data analysis, and plant sciences and their interplay applied to predictive plant phenomics. Transport phenomena, sensor design, image analysis, graph models, network data analysis, fundamentals of genomics and phenomics. Multidisciplinary laboratory exercises.

**M E 590: Special Topics**

Cr. 1-8. Repeatable.



**M E 590Q: Special Topics: Independent Literature Investigation**

Cr. 1-8. Repeatable.

**M E 590T: Special Topics: Biological and Nanoscale Sciences**

Cr. 1-8. Repeatable.

**M E 590U: Special Topics: Complex Fluid Systems**

Cr. 1-8. Repeatable.

**M E 590V: Special Topics: Clean Energy Technologies**

Cr. 1-8. Repeatable.

**M E 590W: Special Topics: Design and Manufacturing Innovation**

Cr. 1-8. Repeatable.

**M E 590Z: Special Topics: Simulation and Visualization**

Cr. 1-8. Repeatable.

**M E 591: Probabilistic Engineering Analysis and Design**

Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Linear algebra or MATH 207; probability theory or STAT 231; or instructor permission*

Applications of probabilistic and statistical methods to engineering system design and post-design failure prognostics. Hands-on learning of various probabilistic and statistical design methods, such as design of experiments, surrogate modeling, uncertainty quantification, reliability-based design, and robust design. It also covers Bayesian estimation and machine learning methods for post-design failure prognostics.

**M E 592: Data Analytics and Machine Learning for Cyber-Physical Systems Applications**

Cr. 3. S.

*Prereq: Basics of linear algebra, probability theory and computer programming*

In this course, several data analytics techniques and Machine Learning algorithms will be explored with a strong focus on various applications to cyber-physical systems. The students will have hands-on experience with various analytics tools and data-driven decision-making techniques applied to a diverse set of spatial, temporal and spatiotemporal data emanating from real-life cyber-physical systems such as robots, energy & power systems, design & manufacturing systems, self-driving cars and agricultural systems. Among various machine learning techniques, special emphasis will be given on deep learning, reinforcement learning and probabilistic graphical models. A key highlight of this course is that the assignments and class projects will be designed for individual students or groups based on their specific applications or data sets of interest.

**M E 599: Creative Component**

Cr. arr. Repeatable.

**Courses for graduate students:**

**M E 600: Seminar**

Cr. R. Repeatable.

(1-0).

**M E 625: Surface Modeling**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: M E 557 or instructor permission*

Theory and implementation of contemporary parametric sculptured surface modeling technology. Non-uniform rational B-spline (NURBS) curves and surfaces. Fundamental computational algorithms. Construction techniques. Advanced modeling topics. Computer projects.

**M E 632: Multiphase Flow**

(Cross-listed with CH E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: M E 538*

Single particle, multiparticle and two-phase fluid flow phenomena (gas-solid, liquid-solid and gas-liquid mixtures); particle interactions, transport phenomena, wall effects; bubbles, equations of multiphase flow. Dense phase (fluidized and packed beds) and ducted flows; momentum, heat and mass transfer. Computer solutions.

**M E 637: Convection Heat Transfer**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: M E 436*

Convection heat transfer to internal or external flows under laminar or turbulent conditions. Dimensionless parameters. Classical solutions of Newtonian viscous flows. Forced and free convection. Special topics.

**M E 638: Radiation Heat Transfer**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: M E 436*

Techniques for analysis of radiation in enclosures. Radiative properties of surfaces. Radiative transfer in participating media. Combined modes of transfer. Approximate methods of analysis.

**M E 647: Advanced Computational Fluid Dynamics**

(Cross-listed with AER E). (3-0) Cr. 3. S.

*Prereq: AER E 547*

An examination of current methods in computational fluid dynamics. Differencing strategies. Advanced solution algorithms for unstructured meshes. Grid generation. Construction of higher-order CFD algorithms. Parallel computing. Current applications. Use of state of the art CFD codes.

**M E 690: Advanced Topics**

Cr. arr. Repeatable.

Investigation of advanced topics of special interest to graduate students in mechanical engineering.

**M E 690G: Advanced Topics: Advanced Machine Design**

Cr. arr. Repeatable.

Investigation of advanced topics of special interest to graduate students in mechanical engineering.

**M E 690O: Advanced Topics: Engineering Computation**

Cr. arr. Repeatable.

Investigation of advanced topics of special interest to graduate students in mechanical engineering.

**M E 690Q: Advanced Topics: Independent Literature Investigation**

Cr. arr. Repeatable.

Investigation of advanced topics of special interest to graduate students in mechanical engineering.

**M E 690T: Advanced Topics: Biological and Nanoscale Sciences**

Cr. arr. Repeatable. F.S.SS.

Investigation of Special Topics: Biological and Nanoscale Sciences of special interest to graduate students in mechanical engineering.

**M E 690U: Advanced Topics: Complex Fluid Systems**

Cr. arr. Repeatable. F.S.SS.

Investigation of Special Topics: Complex Fluid Systems of special interest to graduate students in mechanical engineering.

**M E 690V: Advanced Topics: Clean Energy Technologies**

Cr. arr. F.S.SS.

Investigation of Special Topics: Clean Energy Technologies of special interest to graduate students in mechanical engineering.

**M E 690W: Advanced Topics: Design and Manufacturing Innovation**

Cr. arr. Repeatable.

Investigation of Design & Manufacturing Innovation of special interest to graduate students in mechanical engineering.

**M E 690Z: Advanced Topics: Simulation and Visualization**

Cr. arr. Repeatable. F.S.SS.

Investigation of Special Topics: Simulation and Visualization of special interest to graduate students in mechanical engineering.

**M E 693: Entrepreneurship for Graduate Students in Science and Engineering**

(Cross-listed with AGRON, BCB, E E, ENGR, GENET). (3-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq:* Graduate student status and completion of at least one semester of graduate coursework.

Understanding key topics of starting a technology based company, from development of technology-led idea to early-stage entrepreneurial business. Concepts discussed include: entrepreneurship basics, starting a business, funding your business, protecting your technology/business IP. Subject matter experts and successful, technology-based entrepreneurs will provide real world examples from their experience with entrepreneurship. Learn about the world class entrepreneurship ecosystem at ISU and Central Iowa. Offered on a satisfactory-fail basis only.

**M E 697: Engineering Internship**

Cr. R. Repeatable.

*Prereq:* Permission of Director of Graduate Education, graduate classification One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**M E 699: Research**

Cr. arr. Repeatable.

Offered on a satisfactory-fail basis only.

## Meteorology (MTEOR)

***Any experimental courses offered by MTEOR can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**MTEOR 107: Severe and Hazardous Weather**

(2-0) Cr. 1. F.

Understanding of atmospheric processes that play a role in creating severe and hazardous weather. Focus on thunderstorms, tornadoes, hurricanes, floods, blizzards, ice storms, and temperature extremes. Impacts on lives and property.

**MTEOR 111: Synoptic Applications**

(1-0) Cr. 1. Repeatable. F.

*Prereq:* Credit or concurrent enrollment in MATH 165

Current weather discussions and introduction to synoptic-scale interpretation of meteorology. Application and use of calculus in meteorology. Course restricted to majors. Others with permission of instructor.

**MTEOR 112: Geoscience Orientation**

(Cross-listed with GEOL). (1-0) Cr. 1. F.

Orientation course for students enrolled in the Earth, Wind and Fire Learning Community. Provides an introduction to Iowa State University and meteorology, geology, and Earth science programs for students enrolled in the department's learning community. Activities include academic and social activities, talks and presentations on academic success, resume writing, and study abroad, as well as research talks by faculty members.

**MTEOR 113: Spring Geoscience Orientation for Earth, Wind and Fire Learning Community**

(Cross-listed with GEOL). (1-0) Cr. 1. S.

Spring orientation course for students enrolled in the "Earth, Wind and Fire" Learning Community. Develop and apply quantitative, data-analysis, management, and communication skills on an authentic research project in a team to focus on professionalism and resilience. Introduction to interview strategies and the importance of creating a professional image on social media. Academic and social events, plus two field trips.

**MTEOR 140: Climate and Society**

(Cross-listed with AGRON, ENV S, GEOL). Cr. 3. F.S.

The climate system of our planet. How nature and our actions alter the existing energy balance leading to climate change. Past climates on our planet. The influence of climate on society and resource availability during the Holocene (~ 11,000 years ago to present) with focus on changes post industrial revolution. Significant climate events that have altered our way of life in the past. Projected changes in future climate and potential impacts on society, environment and resources. Adaption to and mitigation of climate change.

Meets International Perspectives Requirement.

**MTEOR 160: Water Resources of the World**

(Cross-listed with AGRON, ENV S, GEOL). (3-0) Cr. 3. S.

Study of the occurrence, history, development, and management of world water resources. Basic hydrologic principles including climate, surface water, groundwater, and water quality. Historical and current perspectives on water policy, use, and the role of water in society and the environment. Meets International Perspectives Requirement.

**MTEOR 201: Introductory Seminar**

Cr. R. F.

*Prereq: Credit or concurrent enrollment in PHYS 231*

An overview of the atmospheric sciences, the meteorology program at Iowa State, and the major research journals used in the discipline.

**MTEOR 206: Introduction to Weather and Climate**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

Basic concepts in weather and climate, including atmospheric measurements, radiation, stability, precipitation, winds, fronts, forecasting, and severe weather. Applied topics include global warming, ozone depletion, world climates and weather safety.

**MTEOR 227: Computational Meteorology I**

(3-1) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in MTEOR 206; Credit or concurrent enrollment in PHYS 231*

An introduction to computer programming using FORTRAN and Python with focus on meteorological applications. Emphasis on basics of good programming techniques and style through extensive practice in top-down design, writing, running, and debugging small programs. Topics include operations and functions, selective execution, repetitive execution, arrays, input/output, file processing, and subprograms. This course is designed for majors.

**MTEOR 265: Scientific Balloon Engineering and Operations**

(Cross-listed with AER E). (0-2) Cr. 1. F.

Engineering aspects of scientific balloon flights. Integration of science mission objectives with engineering requirements. Operations team certification. FAA and FCC regulations, communications, and command systems. Flight path prediction and control.

**MTEOR 290: Independent Study**

Cr. 1-4. Repeatable.

*Prereq: Permission of Instructor*

Independent study for freshman and sophomore students.

**MTEOR 298: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of the Department Cooperative Education Coordinator*  
Required of all cooperative education students. Students must register for this course prior to commencing the work period.

**MTEOR 301: General Meteorology**

(4-0) Cr. 4. S.

*Prereq: MATH 166; credit or concurrent enrollment in PHYS 232*

Global distribution of temperature, wind, and atmospheric constituents; atmospheric thermodynamics, radiative transfer, global energy balance, storms and clouds, introductory dynamics.

**MTEOR 311: Introduction to Synoptic Meteorology**

(1-2) Cr. 2. F.

*Prereq: MTEOR 301*

Concepts of weather map plotting and analysis. Introduction to forecasting and to the use of real-time UNIDATA computer products.

**MTEOR 321: Meteorology Internship**

Cr. 1-2. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: MTEOR 311; Permission of the Department Cooperative Education Coordinator*

Supervised practical experience in a professional meteorological agency. Experiences may include providing weather information for radio, TV, utilities, government agencies, construction, or agribusiness.

**MTEOR 324: Energy and the Environment**

(Cross-listed with ENSCI, ENV S, GEOL). (3-0) Cr. 3. S.

*Prereq: CHEM 163 or CHEM 167 or CHEM 177*

Exploration of the origin of Earth's energy resources and the environmental and climatic impacts of energy acquisition and consumption. Renewable and non-renewable energy resources within an Earth-system context. Various environmentally-relevant topics such as water quality and availability, habitat destruction, greenhouse-gas emissions, and health and safety hazards to wildlife and human communities.

**MTEOR 341: Atmospheric Physics I**

(3-0) Cr. 3. F.

*Prereq: (Credit or concurrent enrollment in MATH 266); MTEOR 301; PHYS 232*

Basic laws of thermodynamics, thermodynamics of water vapor, mixtures of gases, stability, and hydrostatics.

**MTEOR 342: Atmospheric Physics II**

(3-0) Cr. 3. S.

*Prereq: MTEOR 341*

Cloud and precipitation physics, radar meteorology, and atmospheric radiation.

**MTEOR 360: Ocean-Atmosphere Interactions**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MTEOR 206*

The physical interactions between the atmosphere and ocean, and their influence on weather and climate; coupled modes of climate variability and their teleconnections; air-sea feedbacks in the tropics and mid-latitudes. Applied topics include seasonal prediction and climate data analysis.

**MTEOR 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Permission of the Department Cooperative Education Coordinator*  
Required of all cooperative education students. Students must register for this course prior to commencing the work period.

**MTEOR 399: Writing for Research**

(2-0) Cr. 2. S.

*Prereq: ENGL 250; SP CM 212; MTEOR 311; Junior classification; MTEOR major*

Principles of effective scientific writing and communication. Concepts covered are intended to be applied in MTEOR 499: Senior Research.

**MTEOR 402: Watershed Hydrology**

(Dual-listed with MTEOR 502). (Cross-listed with ENSCI, GEOL, NREM).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**MTEOR 404: Global Change**

(Dual-listed with MTEOR 504). (Cross-listed with AGRON, ENSCI, ENV S).

(3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.

**MTEOR 405: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with MTEOR 505). (Cross-listed with AGRON, ENSCI). (3-0) Cr.

3. Alt. S., offered odd-numbered years.

*Prereq: MATH 160 or MATH 165*

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**MTEOR 406: World Climates**

(Cross-listed with AGRON, ENSCI). (3-0) Cr. 3. S.

*Prereq: AGRON 206 or MTEOR 206*

Distribution and causes of different climates around the world. Effects of climate and climate variations on human activities including society, economy and agriculture. Current issues such as climate change and international efforts to assess and mitigate the consequences of a changing climate. Semester project and in-class presentation required. Meets International Perspectives Requirement.

**MTEOR 407: Mesoscale Meteorology**

(Dual-listed with MTEOR 507). (Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* MATH 166; MTEOR 443

Physical nature and practical consequences of mesoscale atmospheric phenomena. Mesoscale convective systems, fronts, terrain-forced circulations. Observation, analysis, and prediction of mesoscale atmospheric structure.

**MTEOR 411: Synoptic Meteorology**

(Dual-listed with MTEOR 511). (1-4) Cr. 3. F.

*Prereq:* MTEOR 311; MTEOR 454

Current weather forecasting and discussion. Applications of atmospheric physics and dynamics in real-time weather situations. Use of UNIDATA computer products.

**MTEOR 416: Hydrologic Modeling and Analysis**

(Dual-listed with MTEOR 516). (Cross-listed with ENSCI, GEOL). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

Study of the basic principles of hydrologic modeling, including rainfall-runoff analysis, lumped and distributed modeling, conceptual and physical models, parameter estimation and sensitivity analysis, input and validation data, uncertainty analysis, and the use of models in surface water hydrology. A range of common models are applied to study hydrologic topics such as flood forecasting and land use change impacts. Previous experience with Matlab or other programming language is needed.

**MTEOR 417: Mesoscale Forecasting Laboratory**

(1-5) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in MTEOR 411

Real-time computer analysis of current weather, with emphasis on small-scale features. Studies of severe weather, lake-effect snow, CSI, cold-air damming.

**MTEOR 432: Instrumentation and Measurements**

(2-2) Cr. 3. S.

*Prereq:* (Credit or concurrent enrollment in MATH 266); PHYS 232

Principles of meteorological sensing and data analysis. Thermometry, barometry, hygrometry, anemometry, precipitation measurements, radiometry, radar, remote sensing, visibility, and cloud height. Calibration and measurement uncertainties. Digital signal processing. Field trip to the National Weather Service. Labs emphasize dataloggers and modern weather stations.

**MTEOR 435: Radar Applications in Meteorology**

(Dual-listed with MTEOR 535). (3-0) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in MTEOR 341

Fundamentals of radar meteorology with emphasis on applications. Topics presented include theory of radar, engineering principles, Doppler radar, polarimetric radar, and applications to remote sensing of clouds and precipitation.

**MTEOR 440: Tropical Meteorology**

(Dual-listed with MTEOR 540). Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Credit or concurrent enrollment in MTEOR 341

Weather and climate of the tropical atmosphere. Weekly forecast discussions related to the development of tropical cyclones and teleconnection patterns between the tropics and higher latitudes. Topics covered include easterly waves, tropical cyclogenesis (i.e., hurricanes, typhoons, cyclones), equatorial waves, El Niño-Southern oscillation, Madden-Julian oscillation, and monsoons.

**MTEOR 443: Dynamic Meteorology I**

(3-0) Cr. 3. S.

*Prereq:* MTEOR 341

Conservation laws, governing equations, circulation and vorticity. Development of quasi-geostrophic theory.

**MTEOR 452: Climate Modeling**

(Dual-listed with MTEOR 552). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* MTEOR 301

Developing and working with climate models based on fundamental physical principles that govern the climate systems of the Earth and other planets. Emphasis on coupled, nonlinear-system interactions of physical processes such as circulation dynamics, radiative transfer, and cloud/precipitation physics, starting with fairly simple 0- and 1-dimensional analytical and numerical models based on energy, mass, and momentum conservation. Observational study of seasonally evolving weather patterns that form climates around the world.

**MTEOR 454: Dynamic Meteorology II**

(Dual-listed with MTEOR 554). (3-0) Cr. 3. S.

*Prereq:* MTEOR 443 or MTEOR 543

Planetary boundary layer, linear perturbation theory, atmospheric wave motions, baroclinic and convective instability, mesoscale circulations.

**MTEOR 468: Applied Geostatistics for Geoscientists**

(Dual-listed with MTEOR 568). (Cross-listed with ENSCI, GEOL). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)*

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

**MTEOR 489: Survey of Remote Sensing Technologies**

(Dual-listed with MTEOR 589). (Cross-listed with E E, ENSCI, GEOL, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**MTEOR 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with MTEOR 589L). (Cross-listed with E E, GEOL, NREM). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**MTEOR 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in Mteor 490 may be counted toward graduation.

**MTEOR 490A: Independent Study: Synoptic Meteorology**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490B: Independent Study: Dynamic Meteorology**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490C: Independent Study: Physical Meteorology**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490D: Independent Study: Instrumentation**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490E: Independent Study: Hydrology**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490F: Independent Study: Climate/Atmospheric Water Cycle**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 490G: Independent Study: Atmosphere/Ocean Interactions**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in MTEOR; Permission of Instructor*

No more than 9 credits in MTEOR 490 may be counted toward graduation.

**MTEOR 498: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of the Department Cooperative Education Coordinator;*

*Senior classification*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**MTEOR 499: Senior Research**

(2-0) Cr. 2. F.

*Prereq: MTEOR 399*

Required of all senior meteorology majors. Research projects in collaboration with faculty. Written and oral presentations of results at the end of the semester.

**Courses primarily for graduate students, open to qualified undergraduates:**

**MTEOR 502: Watershed Hydrology**

(Dual-listed with MTEOR 402). (Cross-listed with ENSCI, GEOL, NREM).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**MTEOR 504: Global Change**

(Dual-listed with MTEOR 404). (Cross-listed with AGRON, ENSCI). (3-0) Cr. 3. F.S.

Recent changes in global biogeochemical cycles and climate; models of future changes in the climate system; impacts of global change on agriculture, water resources and human health; ethical issues of global environmental change.



**MTEOR 505: Soil-Plant-Animal-Atmosphere Physics**

(Dual-listed with MTEOR 405). (Cross-listed with AGRON, ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* MATH 160 or MATH 165

The movement of energy and mass among the soil, vegetation, and atmosphere. The heat and water budget of humans, other animals, plants, and plant communities. Relevance to weather and climate, the effect of climate change on organisms, and remote sensing. Some exposure to computer programming (any language) recommended.

**MTEOR 507: Mesoscale Meteorology**

(Dual-listed with MTEOR 407). (Cross-listed with AGRON). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* MATH 166; MTEOR 443

Physical nature and practical consequences of mesoscale atmospheric phenomena. Mesoscale convective systems, fronts, terrain-forced circulations. Observation, analysis, and prediction of mesoscale atmospheric structure.

**MTEOR 511: Synoptic Meteorology**

(Dual-listed with MTEOR 411). (1-4) Cr. 3. F.

*Prereq:* MTEOR 311; MTEOR 454

Current weather forecasting and discussion. Applications of atmospheric physics and dynamics in real-time weather situations. Use of UNIDATA computer products.

**MTEOR 516: Hydrologic Modeling and Analysis**

(Dual-listed with MTEOR 516). (Cross-listed with ENSCI, ENSCI, GEOL, MTEOR). (2-3) Cr. 3. Alt. S., offered odd-numbered years.

Study of the basic principles of hydrologic modeling, including rainfall-runoff analysis, lumped and distributed modeling, conceptual and physical models, parameter estimation and sensitivity analysis, input and validation data, uncertainty analysis, and the use of models in surface water hydrology. A range of common models are applied to study hydrologic topics such as flood forecasting and land use change impacts. Previous experience with Matlab or other programming language is needed.

**MTEOR 518: Microwave Remote Sensing**

(Cross-listed with AGRON, E E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* Math 265

Microwave remote sensing of Earth's surface and atmosphere using satellite-based or ground-based instruments. Specific examples include remote sensing of atmospheric temperature and water vapor, precipitation, ocean salinity, and soil moisture.

**MTEOR 535: Radar Applications in Meteorology**

(Dual-listed with MTEOR 435). (3-0) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in MTEOR 341

Fundamentals of radar meteorology with emphasis on applications. Topics presented include theory of radar, engineering principles, Doppler radar, polarimetric radar, and applications to remote sensing of clouds and precipitation.

**MTEOR 540: Tropical Meteorology**

(Dual-listed with MTEOR 440). Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Credit or concurrent enrollment in MTEOR 341

Weather and climate of the tropical atmosphere. Weekly forecast discussions related to the development of tropical cyclones and teleconnection patterns between the tropics and higher latitudes. Topics covered include easterly waves, tropical cyclogenesis (i.e., hurricanes, typhoons, cyclones), equatorial waves, El Niño-Southern oscillation, Madden-Julian oscillation, and monsoons.

**MTEOR 542: Physical Meteorology**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* MTEOR 341, MTEOR 342, basic knowledge of dynamic meteorology, or consent of instructor

Basic dynamic equations, moist convection, interaction of convection with large-scale environment, parameterization of convection, and cloud-resolving models.

**MTEOR 552: Climate Modeling**

(Dual-listed with MTEOR 452). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* MTEOR 301

Developing and working with climate models based on fundamental physical principles that govern the climate systems of the Earth and other planets. Emphasis on coupled, nonlinear-system interactions of physical processes such as circulation dynamics, radiative transfer, and cloud/precipitation physics, starting with fairly simple 0- and 1-dimensional analytical and numerical models based on energy, mass, and momentum conservation. Observational study of seasonally evolving weather patterns that form climates around the world.

**MTEOR 554: Dynamic Meteorology II**

(Dual-listed with MTEOR 454). (3-0) Cr. 3. S.

*Prereq:* MTEOR 443 or MTEOR 543

Planetary boundary layer, linear perturbation theory, atmospheric wave motions, baroclinic and convective instability, mesoscale circulations.

**MTEOR 568: Applied Geostatistics for Geoscientists**

(Dual-listed with MTEOR 468). (Cross-listed with ENSCI, GEOL). Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* C R P 351; C R P 452; GEOL 452; (NREM 345 or NREM 446)

Introduction to geospatial data collection, analysis, interpretation, and presentation. Geospatial techniques including geographic information systems (GIS), remote sensing (RS), and global positioning systems (GPS). Study of applied geostatistical analysis (e.g., interpolation and spatial regression).

**MTEOR 589: Survey of Remote Sensing Technologies**

(Dual-listed with MTEOR 489). (Cross-listed with E E, ENSCI, GEOL, NREM). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**MTEOR 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with MTEOR 489L). (Cross-listed with E E, GEOL, NREM). (0-3) Cr. 1. F.

*Prereq:* 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589

Processing and analysis of satellite sensor data (optical and radar).

Provides practical applications in an environmental context.

**MTEOR 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590A: Special Topics: Boundary-layer Meteorology**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590B: Special Topics: Tropical Meteorology**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590C: Special Topics: Mesoscale Meteorology**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590D: Special Topics: Global Climate Systems**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590E: Special Topics: Climate Modeling**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590F: Special Topics: Numerical Weather Prediction**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590G: Special Topics: Satellite Observations**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590H: Special Topics: Statistical Methods in Meteorology**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590I: Special Topics: Field Observations**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590J: Special Topics: Low Frequency Modes**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590K: Special Topics: Cloud Physics**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590L: Special Topics: Atmospheric Radiation**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590M: Special Topics: Hydrology**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 590N: Special Topics: Geophysical Fluid Dynamics**

Cr. 1-3. Repeatable.

*Prereq:* Permission of instructor

Topics of current interest.

**MTEOR 5900: Special Topics: Radar Meteorology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**MTEOR 595: Graduate Seminar**

(Cross-listed with GEOL). Cr. 1. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**MTEOR 595A: Graduate Seminar: Presentation Required**

(Cross-listed with GEOL). (1-0) Cr. 1. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**MTEOR 595B: Graduate Seminar: Attendance Only**

(Cross-listed with GEOL). Cr. R. Repeatable. F.S.

*Prereq: Senior or graduate classification*

Attendance only. Weekly seminar on topics of current research interest. All students seeking a graduate degree must enroll during each semester of residence. Students pursuing a non-thesis option for the M.S. in Earth Science must enroll for one semester. Offered on a satisfactory-fail basis only.

**Courses for graduate students:****MTEOR 605: Boundary-Layer Meteorology**

(Cross-listed with AGRON). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: MTEOR 443 or equivalent-level course in engineering fluids*

Atmospheric boundary-layer structure and dynamics. Diurnal and seasonal variations, turbulent fluxes and turbulence kinetic energy. Measurements and empirical relations for wind and temperature near the ground. Numerical simulation and applications to wind energy.

**MTEOR 699: Research**

Cr. arr. Repeatable.

## Microbiology (MICRO)

*Any experimental courses offered by MICRO can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****MICRO 101: Microbial World**

(3-0) Cr. 3. F.

Introduction to the importance of viruses, bacteria, fungi, archaea and parasites both to humans and to the biosphere. Topics include past and present microbial impact on humans and society, ecology and diversity of microbes, biotechnology and microbial impact on the biosphere. Recommended: High School Biology.

**MICRO 110: Professional and Educational Preparation in Microbiology**

(1-0) Cr. 1. F.

An introduction to curriculum and research opportunities in microbiology at Iowa State. Topics include: easing the transition to life as a university student, development of specific goals, strengthening interpersonal communication, professional portfolio creation and resume building. Offered on a satisfactory-fail basis only.

**MICRO 115: Phage Discovery Lab**

(0-4) Cr. 2. F.

An exploratory laboratory where students will purify phage from soil, visualize phage using electron microscopy and isolate genomic material for nucleic acid sequencing.

**MICRO 116: Phage Genome Annotation Lab**

(0-4) Cr. 2. S.

An experiential microbiology laboratory where students learn to annotate and submit a complete phage genome. MICRO 115 recommended.

**MICRO 201: Introduction to Microbiology**

(2-0) Cr. 2. F.S.

*Prereq: One BIOL course except BIOL 110, BIOL 111, BIOL 112, BIOL 173, BIOL 201, BIOL 307*

Selected topics in microbiology with emphasis on the relationship of microorganisms to human and animal health, agricultural technology, and the environment. With written petition to the chair of the supervisory committee, students who obtain a grade of B or better may substitute 201 for Micro 302 in advanced courses.

**MICRO 201L: Introductory Microbiology Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for non-microbiology majors. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

**MICRO 265: Predicting the Next Epidemic: Living in a One Health World**

Cr. 2. F.S.

8 week course. "One Health" concept as a relatively new approach to disease control, sustainability, and the consequences of environmental disruption. Interconnectedness of human, animal, and environmental health. Importance of scientists communicating with the general public about One Health topics, such as habitat loss, agricultural practices, and the spread of antibiotic resistant organisms. Recommended: High School Biology or Environmental Science.

**MICRO 302: Biology of Microorganisms**

(3-0) Cr. 3. F.S.SS.

*Prereq: BIOL 211; BIOL 212; 3 credits of CHEM*

Basic cell biology, physiology, metabolism, genetics and ecology of microorganisms, with an emphasis on prokaryotes and viruses, as well as the roles of microorganisms in the environment, disease, agriculture, and industry.

**MICRO 302L: Microbiology Laboratory**

(0-3) Cr. 1. F.S.

*Prereq: MICRO 201 or MICRO 302*

Basic microbiology laboratory techniques for majors in microbiology, biological sciences and related fields. Credit for either Micro 201L or 302L, but not both, may be applied toward graduation.

**MICRO 310: Medical Microbiology**

(3-0) Cr. 3. F.

*Prereq: MICRO 302 or (MICRO 201 minimum B grade)*

Study of infection by bacterial and viral pathogenic agents of humans with an overview of immune responses in controlling disease.

**MICRO 310L: Medical Microbiology Laboratory**

(0-3) Cr. 1. F.

*Prereq: (MICRO 201 or MICRO 302); (MICRO 201L or MICRO 302L); MICRO 310*

Microbiological tools and techniques to isolate, identify, and characterize medically significant microorganisms in relation to human diseases. Emphasis on the virulence factors of pathogenic organisms as compared to the normal flora.

**MICRO 320: Molecular and Cellular Bacteriology**

(4-0) Cr. 4. S.

*Prereq: BIOL 313; MICRO 302; CHEM 332*

A systems perspective of bacterial growth, survival, and cellular differentiation by integrating physiological and genetic principles. Emphasis is on prokaryotes although unicellular eukaryotes are also discussed. Topics include the structure, function, and assembly of cell components, molecular and genomic techniques, bioenergetics and metabolism, regulation of gene expression, genetic adaptation, stress tolerance, biofilms, and cell-cell interactions and communications.

**MICRO 353: Introductory Parasitology**

(Cross-listed with BIOL, V PTH). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**MICRO 360: Global Health**

(Cross-listed with GLOBE, V MPM). (3-0) Cr. 3. F.

*Prereq: BIOL 211*

Explores human health across the world with particular emphasis on low- and lower-middle-income countries. Attention is given to the interconnectedness of health determinants, problems, and solutions found in global health, including the role of animals and the environment. Broad in scope, highlighting different cultures and the historical foundations of global health. Topics include colonialism, poverty, emerging diseases, climate change, biodiversity, one health, maternal and child health, HIV, malaria, urbanization, noncommunicable diseases and more. Current events will be a feature of all class meetings. Meets International Perspectives Requirement.

**MICRO 374: Insects and Our Health**

(Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 3 credits in BIOL*

Identification, biology, and significance of insects and arthropods that affect the health of humans and animals, particularly those that are vectors of disease. Meets International Perspectives Requirement.

**MICRO 374L: Insects and Our Health Laboratory**

(Cross-listed with ENT). (0-3) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Credit or concurrent enrollment in ENT 374 or MICRO 374*

Laboratory and field techniques for studying medical or public health entomology, including: collection, identification and maintenance of medically significant arthropods and experimental design and execution related to the biology of arthropods or arthropod-pathogen interactions.

**MICRO 402: Microbial Genetics and Genomics**

(Dual-listed with MICRO 502). (Cross-listed with GEN). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 407: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 507). (Cross-listed with FS HN). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**MICRO 408: Virology**

(3-0) Cr. 3. F.

*Prereq: BBMB 301 or BIOL 313*

The molecular virology and epidemiology of human, animal, plant and insect viruses. BIOL 314 recommended.

**MICRO 419: Foodborne Hazards**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

**MICRO 420: Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

**MICRO 421: Food Microbiology Laboratory**

(Cross-listed with FS HN). (1-5) Cr. 3. S.

*Prereq: MICRO 201 or MICRO 302; MICRO 201L or MICRO 302L. Credit or enrollment in FS HN/MICRO 420*

Standard techniques used for the microbiological examination of foods. Independent and group projects on student-generated questions in food microbiology. Emphasis on oral and written communication and group interaction.

**MICRO 428: Principles of Epidemiology and Population Health**

(Cross-listed with V MPM, VDPAM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**MICRO 430: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 530). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 440: Laboratory in Microbial Physiology, Diversity, and Genetics**

(2-6) Cr. 4. F.S.

*Prereq: BIOL 313L; CHEM 332; MICRO 302; MICRO 302L*

Fundamental techniques and theory for studying the cellular mechanisms, genetic processes and diversity of microbial life. Experimental techniques will include isolation and physiological characterization of bacteria that inhabit different environments as well as an emphasis on genetic and molecular techniques to understand antibiotic resistance processes and mechanisms. Also included are techniques for phylogenetic characterization, measuring gene expression, and genetic manipulation of bacteria. Essential components for the effective communication of scientific results are also emphasized.

**MICRO 450: Undergraduate Capstone Colloquium**

(2-0) Cr. 2. S.

*Prereq: SP CM 212; 20 credits in MICRO*

Required of all undergraduate majors in microbiology. Students demonstrate mastery of core courses in microbiology through discussion of current literature in microbiology and immunology, issues in scientific conduct, and bioethics in microbiology. Students present current papers in a journal club format and gain experience in writing and reviewing grant proposals. This course is a capstone course and should be taken within the last two semesters.

**MICRO 451: Survey in Microbiology**

Cr. R. F.

*Prereq: 12 credits in MICRO*

Preparations for graduation. Topics include job search strategies, career information, mock interviews, graduate and professional school application processes and guidelines as well as outcomes assessment activities.

**MICRO 456: Principles of Mycology**

(Cross-listed with BIOL). (2-3) Cr. 3. F.

*Prereq: 10 credits in BIOL or MICRO*

Morphology, diversity, and ecology of fungi; their relation to agriculture, industry, and human health.

**MICRO 475: Immunology**

(Dual-listed with MICRO 575). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**MICRO 475L: Immunology Laboratory**

(2-4) Cr. 2. S.

*Prereq: MICRO 310 or MICRO 475 or MICRO 575*

Techniques in primary culture and tumor cell growth, measures of lymphocyte function, serological techniques and flow cytometry. Half semester course.

**MICRO 477: Bacterial-Plant Interactions**

(Dual-listed with MICRO 577). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 485: Soil and Environmental Microbiology**

(Dual-listed with MICRO 585). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**MICRO 487: Microbial Ecology**

(Dual-listed with MICRO 587). (Cross-listed with BIOL, ENSCI, GEOL). (3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 490: Independent Study**

Cr. arr. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490A: Independent Study: Laboratory Research**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490B: Independent Study: Literature Review**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490C: Independent Study: Instructional Assistant**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490G: Independent Study: General**

Cr. arr. Repeatable. F.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 490H: Independent Study, Honors**

Cr. 1-5. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Instructor*

A maximum of 6 credits of Micro 490 may be used toward the total of 128 credits required for graduation.

**MICRO 495: Internship**

Cr. 1-2. F.S.

*Prereq: 6 credits of 300-level credit MICRO; Permission of Academic Advisor*

Participation in the Cooperative Extension Intern Program or an equivalent work experience. Written report of activities required. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**



**MICRO 502: Microbial Genetics and Genomics**

(Dual-listed with MICRO 402). (Cross-listed with V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

**MICRO 507: Microbiological Safety of Foods of Animal Origins**

(Dual-listed with MICRO 407). (Cross-listed with FS HN). (3-0) Cr. 3. F.S.

*Prereq: MICRO 201 or MICRO 302*

Examination of the various factors in the production of foods, from production through processing, distribution and final consumption which contribute to the overall microbiological safety of the food. Upon successful completion of this class, the student will receive both the Preventive Controls for Human Foods certificate (FDA program) and the International HACCP Alliance certificate (USDA-FSIS program). Recommended: FS HN 420 or MICRO 420 and one semester of Microbiology Laboratory.

**MICRO 509: Plant Virology**

(Dual-listed with MICRO 509). (Cross-listed with PL P). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**MICRO 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, FS HN, V MPM). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

**MICRO 525: Intestinal Microbiology**

(Cross-listed with V MPM). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

Overview of commensal microbiota in the health and well-being of vertebrates. Topics include diversity of intestinal structure, microbial diversity/function, innate immune development, community interactions and metabolic diseases associated with alterations of the intestinal microbiome.

**MICRO 530: Prokaryotic Diversity and Ecology**

(Dual-listed with MICRO 430). (Cross-listed with BBMB). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: MICRO 302; MICRO 302L*

Survey of the diverse groups of prokaryotes emphasizing important and distinguishing metabolic, phylogenetic, morphological, and ecological features of members of those groups.

**MICRO 540: Livestock Immunogenetics**

(Cross-listed with AN S, V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: AN S 561 or MICRO 575 or V MPM 520*

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

**MICRO 551: Microbial Diversity and Phylogeny**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Comparisons among the three kingdoms of life (Bacteria, Archaea, and Eukarya). Topics will include metabolism, adaptation, methods of phylogenetic analysis, and comparative genomics.

**MICRO 552: Bacterial Molecular Genetics and Physiology**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review of genetics and selected physiological topics of model bacteria.

**MICRO 553: Pathogenic Microorganisms**

(1-0) Cr. 1. F.

*Prereq: MICRO 302, BIOL 313*

Review and contrast/comparison of common bacterial pathogens of plants and animals and their mechanisms of virulence, including toxins, protein secretion, host invasion and iron acquisition strategies. An overview of eukaryotic cell biology that is relevant to pathogenesis will also be included.

**MICRO 554: Virology**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

Introduction to virus life cycles including entry, gene expression strategies, replication, and mechanisms to modify and overcome host defenses. The roles of specific viruses and sub-viral agents in animal and plant disease will also be included.

**MICRO 555: Fungal Biology**

(1-0) Cr. 1. S.

*Prereq: GEN 313 or GEN 320 or equivalent.*

Ecology, genetics, physiology and diversity of fungi, from yeasts to mushrooms, and their importance in human affairs.

**MICRO 556: Ecology of Microorganisms**

(1-0) Cr. 1. S.

*Prereq: MICRO 302, BIOL 313*

The study of microorganisms in their natural environments, with a focus on terrestrial and aquatic ecosystems, including eukaryotic hosts; interactions within biofilms and communities, including intercellular communication and symbioses; microbial adaptations to extreme environments; and metagenomic, genomic, molecular and microscopy techniques for the study of microbes in natural systems.

**MICRO 575: Immunology**

(Dual-listed with MICRO 475). (3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**MICRO 577: Bacterial-Plant Interactions**

(Dual-listed with MICRO 477). (Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**MICRO 585: Soil and Environmental Microbiology**

(Dual-listed with MICRO 485). (Cross-listed with AGRON, ENSCI). (2-3) Cr. 3. F.

*Prereq: AGRON 182*

The living organisms in the soil and what they do. Emphasis on soil biota composition, the carbon cycle and bioremediation, soil-plant-microbial relationships, and environmental issues. MICRO 201; MICRO 201L recommended.

**MICRO 586: Medical Bacteriology**

(Cross-listed with V MPM). (4-0) Cr. 4. F.

*Prereq: Permission of Instructor*

Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses. Concurrent students need to register for 586L.

**MICRO 587: Microbial Ecology**

(Dual-listed with MICRO 487). (Cross-listed with EEOB, ENSCI, GEOL).

(3-0) Cr. 3. F.

*Prereq: Six credits in biology and 6 credits in chemistry*

Introduction to major functional groups of autotrophic and heterotrophic microorganisms and their roles in natural and environmental systems. Consequences of microbial activity on water chemistry, weathering, and precipitation/dissolution reactions will be emphasized.

**MICRO 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

**Courses for graduate students:****MICRO 604: Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Course will expose students to the breadth of subdisciplines within microbiology, offer opportunities for direct interaction between the students and the faculty members within the Interdepartmental Microbiology Graduate Program, and promote interactions among the students within the program. Offered on a satisfactory-fail basis only.

**MICRO 608: Molecular Virology**

(Cross-listed with PL P, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**MICRO 615: Molecular Immunology**

(Cross-listed with BBMB, V MPM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**MICRO 625: Mechanisms of Bacterial Pathogenesis**

(Cross-listed with V MPM). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Credit in BBMB and MICRO*

Review of current concepts in specific areas of microbial pathogenesis including the genetic basis for bacterial disease, genetic regulation and control of virulence factors and their mechanisms of action, and host-pathogen interactions at the cellular and molecular levels. The application of microbial genetics to understanding pathogenesis will be included.

**MICRO 626: Advanced Food Microbiology**

(Cross-listed with FS HN, TOX). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**MICRO 627: Rapid Methods in Food Microbiology**

(Cross-listed with FS HN, TOX). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**MICRO 690: Current Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690A: Current Topics: Microbiology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690B: Current Topics: Immunology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 690C: Current Topics: Infectious Diseases**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of instructor*

Colloquia or advanced study of specific topics in a specialized field.

**MICRO 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with PL P). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.

**MICRO 697: Graduate Research Rotation**

Cr. arr. Repeatable. F.S.

Graduate research projects performed under the supervision of selected faculty members in the Interdepartmental Microbiology major.

**MICRO 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MCDB, V MPM). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**MICRO 699: Research**

Cr. arr. Repeatable.

## Military Science (M S)

*Any experimental courses offered by M S can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**M S 101: Introduction to Military Science**

(1-0) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 101L*

Examines the role of a Cadet in the Army Reserve Officer Training Corps and a Lieutenant in the United States Army. The course explores a military culture whose ultimate success is determined by the character and proficiency of its' leaders. Instruction introduces students to the cultural heritage and history of the U.S. Army. Students will begin to understand the structure of the U.S. Army and how it functions as an organization and institution. The curriculum promotes the development of students' communication skills to enhance their ability to transmit ideas. The class examines how the Army's cultural values drive the development of leadership in the Officer Corps. Hands-on activities enable students to gain insight on the skills and abilities required of cadets and officers interacting with civilians and soldiers.

**M S 101L: Basic Leadership Laboratory I**

(0-2) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 101*

Uses basic military training, missions and scenarios to provide a hands-on method of developing confidence and leadership skills. Students observe and participate in the rotation through various levels of leadership positions at the platoon and squad level within the Army command structure. This concept provides a constant learning environment as they learn to communicate effectively and work as a team while assigned to positions at various levels within the organization. Marching, rifle firing, and tactical patrolling; students gain confidence through rappelling and construction/use of rope bridges; and increase professional knowledge in areas such as first aid, water survival, personal physical fitness, and land navigation. Teaching locations include the ISU Armory, Camp Dodge (National Guard Facility), Pammel Woods (ISU campus), and ISU fitness centers. Full participation in all events will be determined based on students' physical and medical eligibility.

**M S 102: Structure and Function of the U.S. Army**

(1-0) Cr. 1. S.

*Prereq: Concurrent enrollment in M S 102L*

Instructs students on the fundamental skills and proficiencies required of Cadets in the Army Reserve Officer Training Corps and Officers in the United States Army. Allows students to explore the Army culture whose ultimate success is determined by the character and proficiency of its' leaders. Students will gain an insight to the effects of human behavior and communication on the function of the Army's basic unit structures. Special focus is given to the emphasis the Army puts on the development and character of the leader and how that affects the culture and operation of the Army as an institution. Students will develop an understanding of the role that morals and ethics play in becoming an Army Officer and leading American Soldiers. Introduction to basic officer/soldier skills will elucidate the complex role of the Officer in the modern Army.

**M S 102L: Basic Leadership Laboratory II**

(0-2) Cr. 1. S.

*Prereq: Concurrent enrollment in M S 102*

Uses basic military training, missions and scenarios to provide a hands-on method of developing confidence and leadership skills. Rotation through various levels of leadership positions at the platoon and squad level within the Army command structure. Provides a constant learning environment as they learn to communicate effectively and work as a team while assigned to positions at various levels within the organization. Students also learn various military tasks such as marching, rifle firing, and tactical patrolling; gain confidence through rappelling and construction/use of rope bridges; and increase professional knowledge in areas such as first aid, water survival, personal physical fitness, and land navigation. Teaching locations include the ISU Armory, Camp Dodge (National Guard Facility), Pammel Woods (ISU campus), and ISU fitness centers. Full participation in all events will be determined based on students' physical and medical eligibility.

**M S 150: Army Physical Readiness**

(0-3) Cr. 1. Repeatable. F.S.

This lab is designed to use basic military skills and instruction to develop confidence, leadership, and physical fitness. The team approach is utilized in the instruction and application of Army physical fitness requirements. Students will learn various Army physical fitness techniques as well as how to conduct physical fitness sessions. Teaching locations include Lied Recreation Center, Beyer Hall, State Gym as well as around campus. Full participation in all events will be determined based on students physical and medical eligibility.

**M S 201: Principles of Leadership and Communication Skills**

(2-0) Cr. 2. F.

*Prereq: Concurrent enrollment in M S 201L*

Explores the development of leadership and communication skills by understanding and studying the principles, traits, and dynamics of leadership and effective communication techniques. These include; leadership dimensions, human behavior, time management skills, stress management, values and ethics, decision making process, problem solving skills, team building exercises, communication techniques, briefing skills, delegating, nutrition, fitness, and counseling. Leadership assessment programs, role playing, active class participation, speeches, country briefs, and video clips are used to enhance and reinforce the instruction.

**M S 201L: Basic Leadership Laboratory III**

(0-2) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 201*

Uses basic military training, missions and scenarios to provide a hands-on method of developing confidence and leadership skills. Students observe and participate in the rotation through various levels of leadership positions at the platoon and squad level within the Army command structure. Learn to communicate effectively and work as a team while assigned to positions at various levels within the organization. Students also learn various military tasks such as marching, rifle firing, and tactical patrolling; gain confidence through rappelling and construction/use of rope bridges; and increase professional knowledge in areas such as first aid, water survival, personal physical fitness, and land navigation. Teaching locations include the ISU Armory, Camp Dodge (National Guard Facility), Pammel Woods (ISU campus), and ISU fitness centers. Full participation in all events will be determined based on students' physical and medical eligibility.

**M S 202: Map Reading and Land Navigation**

(2-0) Cr. 2. S.

*Prereq: Concurrent enrollment in M S 202L*

Class focuses on the characteristics and features of the earth's land mass and how to apply different methods of conducting navigation on land. These methods include; by use of topographical maps, compasses, aerial photographs, military maps, symbols, and all their practical application. These navigation techniques are used in class in conjunction with patrolling techniques and squad movement exercises. Students will utilize verbal and non-verbal communication, communication techniques, and briefing techniques during this class. Students are also assigned to read one professional book from the Army Reading List and complete a written review of the book in the Army writing style.

**M S 202L: Basic Leadership Laboratory IV**

(0-2) Cr. 1. S.

*Prereq: Concurrent enrollment in M S 202*

Uses basic military training, missions and scenarios to provide a hands-on method of developing confidence and leadership skills. Students observe and participate in the rotation through various levels of leadership positions at the platoon and squad level within the Army command structure. Learn to communicate effectively and work as a team while assigned to positions at various levels within the organization. Students also learn various military tasks such as marching, rifle firing, and tactical patrolling; gain confidence through rappelling and construction/use of rope bridges; and increase professional knowledge in areas such as first aid, water survival, personal physical fitness, and land navigation. Teaching locations include the ISU Armory, Camp Dodge (National Guard Facility), Pammel Woods (ISU campus), and ISU fitness centers. Full participation in all events will be determined based on students' physical and medical eligibility.

**M S 250: Advanced Army Physical Readiness I**

(0-5) Cr. 2. F.

*Prereq: M S 150*

Students learn to plan and conduct physical fitness sessions, following Army physical fitness readiness requirements. Development of physical fitness plan and leadership of training sessions. Participation determined by students' physical and medical eligibility. Course for contracted AROTC cadets.

**M S 251: Advanced Army Physical Readiness II**

(0-5) Cr. 2. S.

*Prereq: M S 150; M S 250*

Students learn to plan and conduct physical fitness sessions, following Army physical fitness readiness requirements. Development of physical fitness plan, and leadership of training sessions. Participation determined by students' physical and medical eligibility.

**M S 290: Independent Study: Basic Military Study**

Cr. 1-3. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: Permission of the Chair of Military Science Department*

Investigation of an approved topic. Must result in a professional journal-worthy paper on ethics, current military issues, interpersonal communications, or leadership development.

**M S 301: Methods of Instructing Military Skills**

(3-0) Cr. 3. F.

*Prereq: Concurrent enrollment in M S 301L*

Develops student's proficiency in analyzing, planning, and executing complex operations within a military organizational structure. Students are given situational opportunities and then measured on their leadership abilities through systematic feedback. Student's evaluations are based on sixteen leadership dimensions within the realms of values, attributes, skills, and actions. Students develop an understanding of human cultural heritage and history, as it pertains to the armed forces. Completion of the basic Military Science program required.

**M S 301L: Advanced Leadership Laboratory I**

(0-4) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 301*

The lab compliments M S 301 by providing opportunities to practice the lessons from class. On-the-job training and evaluation provided by the ROTC cadre. Developing training programs, structuring laboratories, presenting classes, planning various events, and accepting responsibility for the leadership labs. Participating in the Water Survival test, Army Physical Fitness test and the Land Navigation test are required. Completion of the basic Military Science program required.

**M S 302: Applied Leadership**

(3-0) Cr. 3. S.

*Prereq: Concurrent enrollment in M S 302L*

Prepares students to attend the Leadership Develop and Assessment Course at Fort Knox, Kentucky in which they will be assigned specific and situational tasks to accomplish by providing purpose, motivation, and direction to fellow students across the nation. Students will learn how to identify sixteen leadership dimensions in the under classmen and provide specific feedback on their leadership behaviors. Students will develop their oral communication skills about the plans developed by the class, through small group presentation settings. Students will develop methods of studying human behavior. Completion of the basic Military Science program required.

**M S 302L: Advanced Leadership Laboratory II**

(0-4) Cr. 1. S.

*Prereq: Concurrent enrollment in M S 302*

The lab compliments M S 302 by providing opportunities to practice the lessons from class. On-the-job training and evaluation provided by the ROTC cadre. Developing training programs, structuring laboratories, presenting classes, planning various events, and accepting responsibility for the leadership labs. Participating in the Water Survival Test, Army Physical Fitness Test and the Land Navigation test required. Completion of the basic Military Science program required.

**M S 401: Seminar: The Military Team**

(3-0) Cr. 3. F.

*Prereq: Concurrent enrollment in M S 401L*

Develops student proficiency in analyzing and evaluating leadership behaviors, such as values, attributes, skills, and actions. Students are given situational opportunities to assess leadership and provide feedback to other students placed in leadership roles. Students will be measured by their ability to both give and receive systematic and specific feedback on leadership behaviors. Students will develop their ability to communicate thoughts and ideas orally through small group presentations and group discussions. Students will supervise and evaluate the planning and execution of complex operations within a military organizational structure. Completion of the basic Military Science program required.

**M S 401L: Advanced Leadership Laboratory III**

(0-4) Cr. 1. F.

*Prereq: Concurrent enrollment in M S 401*

The lab compliments the instruction from class by demonstrating the indelible link between personal values and successful leadership. On-the-job training and evaluation provided by the ROTC cadre. Developing training programs, structuring laboratories, presenting classes, planning various events, and accepting responsibility for the leadership labs. Completion of the basic Military Science program required.

**M S 402: Seminar: The Professional Military Officer**

(3-0) Cr. 3. S.

*Prereq: Concurrent enrollment in M S 402L*

Explores the dynamics of leading in the complex situations of current military operations in a contemporary world. Students will examine the differences in customs, courtesies and operational principles in the face of international terrorism. Students will also explore aspects of interaction with nongovernmental organizations, civilians and media in a war zone and foreign national governments. The course uses case studies, scenarios, and practical exercises, which prepare the student to face complex ethical and practical demands of leading soldiers within a multifaceted military organizational structure. Completion of the basic Military Science program required.

**M S 402L: Advanced Leadership Laboratory IV**

(0-4) Cr. 1. S.

*Prereq: Concurrent enrollment in M S 402*

The lab compliments the instruction from class by demonstrating the indelible link between personal values and successful leadership. On-the-job training and evaluation provided by the ROTC cadre. Developing training programs, structuring laboratories, presenting classes, planning various events, and accepting responsibility for the leadership labs. Completion of the basic Military Science program required.

**M S 490: Independent Study: Advanced Military Study**

(1-0) Cr. 1-3. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: M S 301; M S 302; M S 401; M S 402; Permission of the Chair of the Military Science Department*

Investigation of an approved topic. Must result in a professional journal-worthy paper on ethics, current military issues, interpersonal communications, or leadership development.

## Molecular, Cellular and Developmental Biology (MCDB)

***Any experimental courses offered by MCDB can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**MCDB 511: Advanced Molecular Genetics**

(Cross-listed with GDCB). (3-0) Cr. 3. S.

*Prereq: BIOL 313 and BBMB 405*

Mechanisms of molecular genetic processes in eukaryotes and prokaryotes, including DNA replication and repair, transcription, translation and regulation of gene expression. Critical evaluation and discussion of current primary literature, methodologies and experimental data.



**MCDB 528: Advances in Molecular Cell Biology**

(Cross-listed with GDCB). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq:* Courses in general cell biology and biochemistry

Cell biological processes including cell signaling, cell division, intracellular trafficking, biogenesis of organelles, cell adhesion and motility.

**MCDB 533: Advances in Developmental Biology**

(Cross-listed with GDCB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* BIOL 314 or Biol 423

Fundamental principles in multicellular development. Emphasis on cellular and molecular regulation of developmental processes, and experimental approaches as illustrated in the current literature.

**MCDB 545: Plant Molecular, Cell and Developmental Biology**

(Cross-listed with GDCB, PLBIO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Biol 313, BIOL 314, BIOL 330 or BBMB 405

Plant nuclear and organelle genomes; regulation of gene expression; hormone signaling; organization, function, and development of plant cells and subcellular structures; regulation of plant growth and development.

**MCDB 590: Special Topics**

Cr. arr. Repeatable.

**Courses for graduate students:****MCDB 697: Graduate Research Rotation**

Cr. 1-6. Repeatable. F.S.

Graduate research projects performed under the supervision of selected faculty members in the molecular, cellular, and developmental biology program.

**MCDB 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MICRO, V MPM). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**MCDB 699: Research**

Cr. arr. Repeatable.

## Music (MUSIC)

*Any experimental courses offered by MUSIC can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****MUSIC 101: Fundamentals of Music**

(1-2) Cr. 2. F.S.

Notation, recognition, execution and analysis of scales, intervals, triads, and rhythm; key signatures; time signatures; transposition. Open to non-majors only. Ability to read elementary musical notation required.

**MUSIC 102: Introduction to Music Listening**

(3-0) Cr. 3. F.S.SS.

Expansion of the music listening experiences for the general student through greater awareness of differences in techniques of listening, performance media, and materials of the art. The course focuses on the elements of music: rhythm, melody, harmony, form, and style, and how these elements are used in musics of different cultures and time periods. Ability to read or perform music not required.

Meets International Perspectives Requirement.

**MUSIC 105: Basic Musicianship**

(1-4) Cr. 3. F.S.

*Prereq:* Performing Arts major or Permission of Instructor

Beginning keyboard techniques, sight-reading, and ear training. Basic materials of music: notation, scales, intervals, key signatures, time signatures, rhythm, and harmony.

**MUSIC 111: Wind Ensemble**

(0-3) Cr. 1. Repeatable. F.S.

Emphasis on significant extended compositions for wind and percussion instruments. Performances include formal concerts on campus and the annual tour. Open to all students by audition.

**MUSIC 112: Concert Band**

(0-2) Cr. 1. Repeatable. F.S.

Repertoire includes the broad spectrum of band music. Two concerts are presented each semester. Open to students who have performed on a wind or percussion instrument in high school band or orchestra.

**MUSIC 113: Jazz Ensemble**

(0-2) Cr. 1. Repeatable. F.S.

Designed to explore various styles and trends in contemporary jazz. Open to all students by audition.

**MUSIC 114: Marching and Pep Bands**

(0-5) Cr. 1. Repeatable.

Performances at athletic events.

**MUSIC 114A: Marching and Pep Bands: Marching Band**

(0-5) Cr. 1. Repeatable. F.

Membership determined by audition and band application. Auditions held for woodwind, brass, percussion, flag, and twirler positions. Presentation of pre-game and half time shows at each home football game; additional performances are also scheduled on and off campus. Audition information is listed on the band website ([www.music.iastate.edu/org/marching](http://www.music.iastate.edu/org/marching)). Students may not be concurrently enrolled in MUSIC 114A and 114C.

**MUSIC 114B: Marching and Pep Bands: Pep Band**

(0-5) Cr. 1. Repeatable. S.

Performances at basketball games. Students selected by audition from members of MUSIC 114A.

**MUSIC 114C: Marching and Pep Bands: Pep Band for Wrestling and Soccer**

(0-5) Cr. 1. Repeatable. F.

Performances at wrestling and women's soccer games. Audition required. Students may not be concurrently enrolled in MUSIC 114A and 114C.

**MUSIC 115: Symphonic Band**

(0-3) Cr. 1. Repeatable. F.S.

Stresses high quality wind literature. Performances include formal concerts on campus. Open to all students by audition.

**MUSIC 118: Applied Music: Non-majors**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Applied music for the general student. Audition required.

**MUSIC 118A: Applied Music: Non-majors: Voice**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Audition required. Will not satisfy applied music requirements for music majors.

**MUSIC 118B: Applied Music: Non-majors: Piano**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Audition required. Will not satisfy applied music requirements for music majors.

**MUSIC 118C: Applied Music: Non-majors: Organ**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 118D: Applied Music: Non-majors: Strings**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 118E: Applied Music: Non-majors: Carillon**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 118F: Applied Music: Non-majors: Woodwinds**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 118G: Applied Music: Non-majors: Brass**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Audition required. Will not satisfy applied music requirements for music majors.

**MUSIC 118I: Applied Music: Non-majors: Percussion**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Audition required. Will not satisfy applied music requirements for music majors.

**MUSIC 118K: Applied Music: Non-majors: Harpsichord**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Audition required. Will not satisfy applied music requirements for music majors.

**MUSIC 119: Applied Music for Majors**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

Applied music for music majors. Audition required.

**MUSIC 119A: Applied Music for Majors: Voice**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119B: Applied Music for Majors: Piano**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119C: Applied Music for Majors: Organ**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required.

**MUSIC 119D: Applied Music for Majors: Strings**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119E: Applied Music for Majors: Carillon**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119F: Applied Music for Majors: Woodwinds**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119G: Applied Music for Majors: Brass**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119I: Applied Music for Majors: Percussion**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 119K: Applied Music for Majors: Harpsichord**

(0.5-2) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: MUSIC major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 120: Introduction to Music Literature and Styles**

(3-0) Cr. 3. S.

*Prereq: MUSIC 224*

Directed studies via aural analysis for music majors with emphasis on the materials of music, form and aesthetic issues. Introduction to style and literature of the major performance media in context of historical chronology. Fundamentals of score reading and performance terminology. Only one of Music 120 and 302 can count toward graduation.

**MUSIC 125: Class Voice**

(0-2) Cr. 1. Repeatable, maximum of 8 credits. F.S.

Individual voice study in a communal master class setting designed to introduce collegiate level singing to Performing Arts majors and non-music (voice) majors.

**MUSIC 127: Class Study in Piano I**

(0-2) Cr. 1. F.S.

*Prereq: MUSIC major or Permission of Instructor*

Beginning keyboard technique, transposition, harmonization, ensemble and solo repertory, and sight-reading skills.

**MUSIC 128: Class Study in Piano II**

(0-2) Cr. 1. F.S.

*Prereq: MUSIC 127 or Permission of Instructor*

Continuation of beginning keyboard technique, transposition, harmonization, ensemble and solo repertory, and sight-reading skills.

**MUSIC 141: Lyrica Ensemble**

(0-3) Cr. 1. Repeatable. F.S.

Large chorus; emphasis on wide variety of literature and singing sounds from around the world. Includes fundamental voice and choral skills. Campus concerts each semester. Open to all treble voice students by audition.

**MUSIC 151: University Chorus**

(0-3) Cr. 1. Repeatable. F.S.

Advanced skills required, high quality literature. Campus concerts each semester, some concerts in conjunction with orchestras. Men's and women's choirs separately and in combination. Open to all students by audition.

**MUSIC 151A: University Chorus: Cantamus Women's Choir**

(0-3) Cr. 1. Repeatable. F.S.

Large chorus; emphasis on adventurous, contemporary programming. Advanced skills required. Campus concerts each semester, some in conjunction with orchestra. Open to all treble voice students by audition.

**MUSIC 151B: University Chorus: Statesmen Men's Choir**

(0-3) Cr. 1. Repeatable. F.S.

Advanced skills required, high quality literature. Campus concerts each semester, some concerts in conjunction with orchestras. Men's and women's choirs separately and in combination. Open to all students by audition.

**MUSIC 161: Iowa State Singers**

(0-5) Cr. 1. Repeatable. F.S.

Concert choir specializing in performance of advanced music literature, Renaissance through contemporary. Campus concerts, annual spring tour. Open to all students by audition.

**MUSIC 181: Symphony Orchestra**

(0-4) Cr. 1. Repeatable. F.S.

Reading, preparation, and performance of standard repertoire. Five or six concerts annually plus occasional off-campus appearances. Open to all students by audition.

**MUSIC 219: Applied Music: Majors**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: MUSIC major; Permission of Instructor*

Applied music for music majors. Audition required.

**MUSIC 219A: Applied Music: Majors: Voice**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219B: Applied Music: Majors: Piano**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219C: Applied Music: Majors: Organ**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219D: Applied Music: Majors: Strings**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219E: Applied Music: Majors: Carillon**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219F: Applied Music: Majors: Woodwinds**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219G: Applied Music: Majors: Brass**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219I: Applied Music: Majors: Percussion**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 219K: Applied Music: Majors: Harpsichord**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 224: Music Theory I**

(4-0) Cr. 4. F.

*Prereq: MUSIC major or Permission of Instructor*

Introduction to voice-leading principles. Application of diatonic harmony in analysis and four-part writing. Introduction to notation software and other technologies used in the study of music. Specific section recommendation will be made to students based on results of diagnostic exam.

**MUSIC 225: Aural Theory I**

(0-2) Cr. 1. F.

*Prereq: (MUSIC major; credit or concurrent enrollment in MUSIC 224) or Permission of Instructor*

Aural discrimination of intervals, rhythms and patterns, as demonstrated by proficiency in ear training, sight singing, and related musicianship skills.

**MUSIC 227: Class Study in Piano III**

(0-2) Cr. 1. F.S.

*Prereq: MUSIC 128 or Permission of Instructor*

Intermediate keyboard technique, transposition, harmonization, improvisation, repertory, and sight-reading skills. Introduction to score reading, hymn playing, and accompanying at the piano.

**MUSIC 228: Class Study in Piano IV**

(0-2) Cr. 1. F.S.

*Prereq: MUSIC 227 or Permission of Instructor*

Continuation of intermediate keyboard technique, transposition, harmonization, improvisation, repertory, score reading, hymn playing, and accompanying at the piano.

**MUSIC 234: Music Theory II**

(3-0) Cr. 3. S.

*Prereq: MUSIC 224*

Harmonic and melodic materials of tonal music including chromatic secondary function chords and modulation techniques. Application of these materials in analysis, part writing, and composition. Concurrent enrollment in MUSIC 235 recommended.

**MUSIC 235: Aural Theory II**

(0-3) Cr. 1. S.

*Prereq: MUSIC 225; credit or concurrent enrollment in MUSIC 234*

Development of sight singing, ear training, and related musicianship skills with emphasis on diatonic harmonic and melodic materials as well as rhythm.

**MUSIC 246: Introduction to Creative Digital Music**

(2-0) Cr. 2. F.S.

Introduction to audio and MIDI software used in creating digital music. Includes fundamentals of audio waveform editing, processing, and mixing, MIDI data structures, practical projects in musical composition using a digital audio workstation. Ability to read traditional music notation preferred.

**MUSIC 248: Technology in Music Instruction**

(2-0) Cr. 2. S.

*Prereq: MUSIC 224; MUSIC 225*

Introduction to computer software applications used in musical arrangements and presentations, practical introduction to audio and MIDI technologies in lab-based music instruction, basic recording/sound reinforcement and music website management. Intended for Music Education Majors.

**MUSIC 265: Music in Elementary Education**

(2-0) Cr. 2. F.S.

*Prereq: HD FS 102 or PSYCH 230*

Experiencing and understanding the fundamentals of music through singing, playing classroom instruments, body movement, reading notation, listening, and creative activities. Developing lesson plan strategies and sequence, exploring multicultural musics, integrating music with other subjects in the elementary classroom, and evaluating aspects of musical learning.

**MUSIC 266: Introduction to Music Education**

(1-2) Cr. 2. S.

*Prereq: Concurrent enrollment in MUSIC 280K*

Required for first-year majors in music education. Historical, philosophical, and social foundations of music education; music curricula overview including goals of the music program, and contemporary and international curriculum development; psychology of teaching music including discipline techniques. Preparation for required observations in area schools.

**MUSIC 280K: Pre-Student Teaching Experience I: Music**

(Cross-listed with EDUC). Cr. 0.5. Repeatable. S.

Pre-student teaching experience in music in school settings. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 1. Offered on a satisfactory-fail basis only. EDUC 280 may be taken more than once for credit toward graduation.

**MUSIC 290: Special Problems**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*  
Independent study.

**MUSIC 290A: Special Problems: Education**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*  
Independent study in music education.

**MUSIC 290B: Special Problems: Theory**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*  
Independent stud in music theory.

**MUSIC 290C: Special Problems: Composition**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in music composition.

**MUSIC 290D: Special Problems: History**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in music history.

**MUSIC 290E: Special Problems: Literature**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in music literature.

**MUSIC 290F: Special Problems: Applied Music**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in applied music.

**MUSIC 290G: Special Problems: Conducting**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in conducting.

**MUSIC 290H: Special Problems, Honors**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent honors project in music.

**MUSIC 290J: Special Problems: Business**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent study in music business.

**MUSIC 301: Opera Studio**

Cr. 1-3. Repeatable. F.S.

Study of selected opera scenes, chamber operas, and works from contemporary and classical music theater. Basic stagecraft, role interpretation, production.

**MUSIC 301A: Opera Studio: Opera/Operetta**

Cr. 1-3. Repeatable. F.S.

Study of selected opera scenes and chamber operas. Basic stagecraft, role interpretation, production.

**MUSIC 301B: Opera Studio: Music Theater**

Cr. 1-3. Repeatable. F.S.

Study of selected works from contemporary and classical music theater. Basic stagecraft, role interpretation, production.

**MUSIC 302: Masterpieces of Music and Art in Western Culture.**

(3-0) Cr. 3. S.

*Prereq: MUSIC 102*

Exploration of several great works of classical music in light of the artistic culture in which they were composed; and trends in musical styles as well as individual composers' personalities over history through listening and discussion. Some concert attendance is required outside of class. An ability to read music is not required, but is recommended. Non-majors only. Only one of Music 120 and 302 can count toward graduation.

**MUSIC 304: History of American Rock 'n' Roll**

(3-0) Cr. 3. F.S.

Rock 'n' Roll from the mid 1950s through the present, focusing on the development of rock styles from its roots in blues and folk music.

Explores the various overlaps and cross-overs with other musical traditions including hip-hop, country, and pop. Expansion of listening experience through study of song forms, musical instruments of rock, and socio-political influences. Quizzes and examinations required. Ability to read or perform music not required.

**MUSIC 318: Applied Music: Non-majors**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Applied music for students other than music majors. Audition required.

**MUSIC 318A: Applied Music: Non-majors: Voice**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318B: Applied Music: Non-majors: Piano**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318C: Applied Music: Non-majors: Organ**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.



**MUSIC 318D: Applied Music: Non-majors: Strings**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318E: Applied Music: Non-majors: Carillon**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318F: Applied Music: Non-majors: Woodwinds**

(0.5-0) Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318G: Applied Music: Non-majors: Brass**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318I: Applied Music: Non-majors: Percussion**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 318K: Applied Music: Non-majors: Harpsichord**

(0.5-0) Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

(.5-0) for 1 cr. (1-0) for 2 cr. Applied music for the general student. Open only to non-majors. Will not satisfy applied music requirements for music majors. Audition required.

**MUSIC 319: Applied Music: Majors**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

Applied music for music majors. Audition required.

**MUSIC 319A: Applied Music: Majors: Voice**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319B: Applied Music: Majors: Piano**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319C: Applied Music: Majors: Organ**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319D: Applied Music: Majors: Strings**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319E: Applied Music: Majors: Carillon**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319F: Applied Music: Majors: Woodwinds**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319G: Applied Music: Majors: Brass**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319I: Applied Music: Majors: Percussion**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 319K: Applied Music: Majors: Harpsichord**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; passing grade on continuation exam; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 321: Advanced Ensemble**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in chamber music ensembles that demand high proficiency. Advanced proficiency and performing ability required.

**MUSIC 321A: Advanced Ensemble: Voice**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321B: Advanced Ensemble: Piano**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321C: Advanced Ensemble: Organ**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321D: Advanced Ensemble: Strings**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321F: Advanced Ensemble: Woodwinds**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321G: Advanced Ensemble: Brass**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321I: Advanced Ensemble: Percussion**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 321J: Advanced Ensemble: Mixed instruments/voice**

(0-3) Cr. 1. Repeatable. F.S.

*Prereq: Permission of Instructor*

Performance in ensembles that demand high proficiency. Open to a limited number of undergraduate and graduate students. Advanced proficiency and performing ability required.

**MUSIC 324: English and Italian Diction for Singing**

(2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: Credit or enrollment in MUSIC 118A or MUSIC 119A*

The international phonetic alphabet and its application to correct pronunciation of English and Italian in singing.

**MUSIC 325: French and German Diction for Singing**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Credit or enrollment in MUSIC 118A or MUSIC 119A*

The international phonetic alphabet and its application to correct pronunciation of French and German in singing.

**MUSIC 327: Functional Piano**

(0-3) Cr. 2.

Emphasis on sight reading, three and four-part score reading, improvisation, accompanying, and advanced harmonization.

**MUSIC 327A: Functional Piano: Keyboard majors.**

(0-3) Cr. 2.

*Prereq: MUSIC 228 or Permission of Instructor*

Emphasis on sight reading, three and four-part score reading, improvisation, accompanying, and advanced harmonization.

**MUSIC 327B: Functional Piano: Voice Majors**

(0-3) Cr. 2. S.

*Prereq: MUSIC 228 or Permission of Instructor*

Emphasis on sight reading, three and four-part score reading, improvisation, accompanying, and advanced harmonization.

**MUSIC 334: Music Theory III**

(3-0) Cr. 3. F.

*Prereq: MUSIC 234*

Characteristics of common practice chromatic harmony and analytical techniques addressing stylistic practices of music since 1900. Application of these materials to analysis, part writing, and composition. Concurrent enrollment in 335 recommended.

**MUSIC 335: Aural Theory III**

(0-2) Cr. 1. F.

*Prereq: MUSIC 235; credit or concurrent enrollment in MUSIC 334*

Development of sight singing, ear training, and related musical skills with emphasis on melodic, harmonic and rhythmic materials from the eighteenth and nineteenth centuries.

**MUSIC 344: Music Theory IV**

(3-0) Cr. 3. S.

*Prereq: MUSIC 334*

Improvisation on existing materials in a variety of styles and arranging for vocal and instrumental ensembles while learning the characteristics of each instrument including voice. Concurrent enrollment in MUSIC 345 recommended.

**MUSIC 345: Aural Theory IV**

(0-2) Cr. 1. S.

*Prereq: MUSIC 335; credit or concurrent enrollment in MUSIC 344*

Development of sight singing, ear training, and related musical skills with emphasis on melodic, harmonic and rhythmic materials from the nineteenth and twentieth centuries.

**MUSIC 346: Computer Music Programming Design**

(3-0) Cr. 3. S.

*Prereq: MUSIC 246 or Permission of Instructor*

Programming and interface design for creative musical applications. Includes computer generation of music data, advanced MIDI data processing, practical projects in musical composition and performance using a visual programming language.

**MUSIC 350: Instrumental Techniques: Strings**

(0-2) Cr. 1. F.

*Prereq: Music major; concurrent enrollment in MUSIC 358B or MUSIC 358C*

Techniques and skills required for teaching of instruments. Examination of materials for school use. Intended for instrumental music education students.

**MUSIC 351: Instrumental Techniques: Clarinet, Flute, Saxophone**

(1-2) Cr. 2. S.

*Prereq: Music major; concurrent enrollment in MUSIC 358B or MUSIC 358C*  
Techniques and skills required for teaching of instruments. Examination of materials for school use. Intended for instrumental music education students.

**MUSIC 352: Instrumental Techniques: Oboe, Bassoon**

(0-2) Cr. 1. F.

*Prereq: MUSIC major; concurrent enrollment in MUSIC 358B or MUSIC 358C*  
Techniques and skills required for teaching of instruments. Examination of materials for school use. Intended for instrumental music education students.

**MUSIC 353: Instrumental Techniques: Trumpet, Horn**

(0-2) Cr. 1. F.

*Prereq: Music major; concurrent enrollment in MUSIC 358B or MUSIC 358C*  
Techniques and skills required for teaching of instruments. Examination of materials for school use. Intended for instrumental music education students.

**MUSIC 354: Instrumental Techniques: Trombone, Baritone, Tuba**

(0-2) Cr. 1. S.

*Prereq: MUSIC major; concurrent enrollment in MUSIC 358B or MUSIC 358C*  
Techniques and skills required for teaching of instruments. Examination of materials for school use. Intended for instrumental music education students.

**MUSIC 355: Instrumental Techniques: Percussion**

(0-2) Cr. 1. S.

*Prereq: Music major; concurrent enrollment in MUSIC 358B or MUSIC 358C*  
Techniques and skills required to teach percussion instruments in the schools. Techniques for performing and teaching snare drum, keyboard percussion instruments, timpani, band and orchestral hand instruments, drum set, and Latin percussion. Intended for instrumental music education students.

**MUSIC 358: Lab Ensemble**

Cr. R. Repeatable.

Review and selection of appropriate literature for ensembles of differing levels and abilities; conducting and rehearsal experience. Intended for music education students. For vocal music education majors, expected every semester offered. For instrumentalists, concurrent enrollment in 358B or 358C is expected while in Techniques classes (Music 350-355).

**MUSIC 358A: Lab Ensemble: Choral**

Cr. R. Repeatable. F.Alt. S., offered odd-numbered years.

Sight singing, conducting, and accompanying experience in conjunction with 362A and 465. Required of all vocal music education majors. Offered on a satisfactory-fail basis only.

**MUSIC 358B: Lab Ensemble: Instrumental**

Cr. R. Repeatable. F.S.

Performance on secondary instruments and conducting. Includes experiences with wind, string, and percussion instruments and techniques. Required of all instrumental music education majors. Offered on a satisfactory-fail basis only.

**MUSIC 360: Voice Pedagogy**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Credit or concurrent enrollment in MUSIC 219A*

Physical, acoustical, and musical properties of the vocal instrument, including a survey of important texts and articles on singing and voice production.

**MUSIC 361: Conducting I**

(1-2) Cr. 2. F.

*Prereq: (MUSIC 234; MUSIC 235; Music major) or Permission of Instructor*

Introduction to conducting; score reading and analysis. Conveying musical ideas through appropriate gestures. Leadership role of the conductor.

**MUSIC 362: Conducting II**

(1-2) Cr. 2.

**MUSIC 362A: Conducting II: Choral Conducting Techniques**

(1-2) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: MUSIC major; MUSIC 361; concurrent enrollment in MUSIC 358A; concurrent enrollment in (MUSIC 141, MUSIC 151, or MUSIC 161)*

Advanced baton technique, score preparation and interpretation of choral repertoire.

**MUSIC 362B: Conducting II: Instrumental Conducting Techniques**

(1-2) Cr. 2. S.

*Prereq: MUSIC major; MUSIC 361; concurrent enrollment in MUSIC 358B*

Advanced baton technique. Score preparation. Specific problems of large instrumental ensembles.

**MUSIC 366: Methods of Music Education**

(2-0) Cr. 2. F.

*Prereq: MUSIC major; MUSIC 266; concurrent enrollment in MUSIC 480K*

Music education strategies and materials including development of appropriate objectives and plans for general music classes utilizing traditional and multicultural musics, evaluating musical learning; overview of Orff Schulwerk, Kodaly, and Dalcroze approaches; music in special education; required teaching in lab settings and observations in area schools. Admission to Education Preparation Program required.

**MUSIC 367: Choral Literature**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

Overview of choral repertoire from the sixteenth century to the present, including accessible works for the young conductor. MUSIC 361 recommended.

**MUSIC 368: Marching Band and Jazz Ensemble Techniques**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: MUSIC major*

Techniques and materials for teaching marching band in the high school; philosophy, computer assisted drill design, music analysis, band set up, and other related skills. Jazz style, articulation, phrasing, materials and teaching techniques for secondary school jazz ensembles. Credit or enrollment in MUSIC 362B recommended.

**MUSIC 369: String Pedagogy**

(0-2) Cr. 1. Alt. S., offered odd-numbered years.

*Prereq: MUSIC major*

Practical examination of current teaching methods and materials. Intended for string instrumental music education majors.

**MUSIC 374: Instrumental Methods for Vocalists**

(1-0) Cr. 1. Repeatable, maximum of 15 credits. F.

*Prereq: MUSIC major; MUSIC 280K*

Techniques and skills required to teach instrumental music in K-12 schools. Introduction of instruments, score reading and transposition, rehearsal techniques, literature, resources and other related skills. Intended for vocal music education majors and required for Iowa teaching license. Admission to Education Preparation Program required.

**MUSIC 375: Choral Methods for Instrumentalists**

(1-0) Cr. 1. S.

*Prereq: MUSIC major; MUSIC 280K*

Techniques and skills required to teach vocal/choral music in K-12 schools. Vocal production and health, rehearsal techniques, repertoire, resources and other related skills. Intended for instrumental music education majors and required for Iowa teaching license. Admission to Educator Preparation Program required.

**MUSIC 380K: Pre-Student Teaching Experience II: Music**

(Cross-listed with EDUC). (1-8) Cr. 1-2.

*Prereq: Admission to Educator Preparation Program*

Participation in a K-12 school setting. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 2. Offered on a satisfactory-fail basis only.

**MUSIC 383: History of Music I**

(3-0) Cr. 3. F.

*Prereq: (MUSIC 120; Music major) or Permission of Instructor*

History of the stylistic and cultural development of music: Middle Ages through Baroque.

Meets International Perspectives Requirement.

**MUSIC 384: History of Music II**

(3-0) Cr. 3. S.

*Prereq: (MUSIC 120; Music major) or Permission of Instructor*

History of the stylistic and cultural development of music: Classical through contemporary music.

Meets International Perspectives Requirement.

**MUSIC 415: Literature and Pedagogy in Applied Music**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415A: Literature and Pedagogy in Applied Music: Voice**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415B: Literature and Pedagogy in Applied Music: Piano**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415C: Literature and Pedagogy in Applied Music: Organ**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415D: Literature and Pedagogy in Applied Music: Strings**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415E: Literature and Pedagogy in Applied Music: Carillon**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415F: Literature and Pedagogy in Applied Music: Woodwinds**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415G: Literature and Pedagogy in Applied Music: Brass**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415I: Literature and Pedagogy in Applied Music: Percussion**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 415J: Literature and Pedagogy in Applied Music: Jazz Pedagogy and Performance**

Cr. 1-4. Repeatable. F.S.

*Prereq: Permission of Instructor*

Includes experience in technology relative to the particular discipline.

**MUSIC 417: Student Teaching**

Cr. 8-12. F.S.

*Prereq: MUSIC major; minimum cumulative GPA of 2.5*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences. Admission to teacher education required.

**MUSIC 417R: Student Teaching: Music-Elementary**

(Dual-listed with MUSIC 517R). (Cross-listed with EDUC). Cr. arr.

Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**MUSIC 417S: Student Teaching: Music-Secondary**

(Dual-listed with MUSIC 517S). (Cross-listed with EDUC). Cr. arr.

Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program; approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**MUSIC 419: Applied Music: Majors**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

Applied music for music majors. Audition required.

**MUSIC 419A: Applied Music: Voice**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419B: Applied Music: Piano**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419C: Applied Music: Organ**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419D: Applied Music: Strings**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419E: Applied Music: Carillon**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419F: Applied Music: Woodwinds**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419G: Applied Music: Brass**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419I: Applied Music: Percussion**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 419K: Applied Music: Harpsichord**

(1-2) Cr. 1-3. Repeatable. F.S.

*Prereq: Music major; Permission of Instructor*

(.5-2) for 1 cr. (1-2) for 2-3 cr. Minimum weekly practice of 5 hours per credit is expected. Weekly seminar required. Audition required.

**MUSIC 420: Junior/Senior Recital**

Cr. R. Repeatable. F.S.SS.

*Prereq: Concurrent enrollment in MUSIC 219, MUSIC 319, or MUSIC 419*

Performance of advanced repertory in a public concert. Preparation of program notes. Advanced performing ability required. Offered on a satisfactory-fail basis only.

**MUSIC 434: Applied Theory: Improvising and Arranging**

(3-0) Cr. 3. S.

*Prereq: MUSIC 344; MUSIC 345*

Practical uses for music theory. Emphasis on arranging for vocal and instrumental ensembles and creating improvisations on existing materials in a variety of styles.

**MUSIC 440: Seminar in Music Theory**

(3-0) Cr. 3. Repeatable. Alt. F., offered even-numbered years.

*Prereq: MUSIC 344; MUSIC 345*

Various topics in music theory including analysis, counterpoint, arranging, pedagogy, and psychology of music. Content will vary. Contact the Department of Music for the current year offering.

**MUSIC 446: Sound Synthesis Design for Electronic Music**

(3-0) Cr. 3. F.

*Prereq: MUSIC 246 or Permission of Instructor*

Digital sound synthesis structures for creative musical applications. Includes modular sound synthesis techniques, software synthesizer design, and practical projects in electronic music composition.

**MUSIC 464: Instrumental Administration, Materials, and Methods**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: MUSIC major*

Instructional materials and methods appropriate for teaching instrumental music in elementary, middle school, and high school music programs. Required observations in area schools. Intended for instrumental music education students. Credit or enrollment in MUSIC 362B recommended.

**MUSIC 465: Choral Materials and Methods**

(2-0) Cr. 2. F.

*Prereq: MUSIC major; MUSIC 366; concurrent enrollment in MUSIC 358A*

Instructional materials and methods appropriate for teaching choral music in the secondary school. Emphasis on pedagogy and rehearsal techniques. Required observations in area schools. Intended for vocal music education students.



**MUSIC 466: Program Development and Evaluation in Music Education**

(2-1) Cr. 2. F.

*Prereq: MUSIC 362; credit or concurrent enrollment in MUSIC 366; concurrent enrollment in MUSIC 480K*

Developing a rationale for music education; music program development; evaluation of music curricula, programs and facilities; professional growth of the teacher; preparation for student teaching and the job market. Required observations in area schools.

**MUSIC 472: History of American Music**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: MUSIC 101 or MUSIC 224*

History and development of the sacred and secular music in North America from approximately 1600 to the present, exploring the diverse cultural backgrounds that have contributed to the variety of contemporary musical styles. Ability to read music required.

Meets U.S. Diversity Requirement

**MUSIC 473: Topics in Advanced Music History**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: MUSIC 383; MUSIC 384*

Detailed topic-based study of major composers and compositions from 1600 to the present with a strong research component.

**MUSIC 475: Music of the Romantic Era**

(3-0) Cr. 3.

*Prereq: MUSIC 383; MUSIC 384*

Offered F. 2012. Detailed survey of instrumental, vocal, choral, and keyboard music from 1825 to 1910.

**MUSIC 476: Music of the Twentieth Century**

(3-0) Cr. 3.

*Prereq: MUSIC 383; MUSIC 384*

Offered S 2013. Detailed survey of instrumental, vocal, choral, and keyboard music from 1900 to the present.

**MUSIC 480K: Pre-Student Teaching Experience III: Music**

(Cross-listed with EDUC). Cr. 1-2. Repeatable. F.S.

*Prereq: Admission to Educator Preparation Program*

Participation in a K-12 school setting. Permission of Music coordinator required prior to enrollment. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**MUSIC 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490A: Independent Study: Education**

(Cross-listed with EDUC). Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

Independent Study in Music.

**MUSIC 490B: Independent Study: Theory**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490C: Independent Study: Composition**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490D: Independent Study: History**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490E: Independent Study: Literature**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490F: Independent Study: Applied Music**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490G: Independent Study: Conducting**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490H: Independent Study: Honors**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**MUSIC 490I: Independent Study: Electronic Music**

Cr. arr. Repeatable. F.S.SS.

*Prereq: 12 credits in MUSIC; Department Permission*

**Courses primarily for graduate students, open to qualified undergraduates:**

**MUSIC 517R: Student Teaching: Music-Elementary**

(Dual-listed with MUSIC 417R). (Cross-listed with EDUC). Cr. arr.

Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**MUSIC 517S: Student Teaching: Music-Secondary**

(Dual-listed with MUSIC 417S). (Cross-listed with EDUC). Cr. arr.

Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program; approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences.

**MUSIC 590: Special Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590A: Special Topics: Education**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590B: Special Topics: Theory**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590C: Special Topics: Composition**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590D: Special Topics: History**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590E: Special Topics: Literature**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590F: Special Topics: Applied Music**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590G: Special Topics: Conducting**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head***MUSIC 590I: Special Topics: Electronic Music**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor, approval of department head*

## Natural Resource Ecology and Management (NREM)

***Any experimental courses offered by NREM can be found at:***

registrar.iastate.edu/faculty-staff/courses/explistings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:****NREM 104: Practical Work Experience**

Cr. R.

Three months of relevant work experience in natural resources, animal ecology, or forestry. Study at a summer biological station may be applicable. See advisor for specific requirements and approval process.

**NREM 110: Orientation in Natural Resource Ecology and Management**

Cr. 1. F.

Orientation to the University and to the Department of Natural Resource Ecology and Management. Discussion of departmental learning outcomes, strategies for academic success and academic planning. Offered on a satisfactory-fail basis only.

**NREM 111: NREM Transitions Learning Community Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Enrollment limited to members of the NREM Transitions Learning Community. Designed to assist new transfer students and continuing sophomore students with their transition to the academic expectations and professional development aspects of the natural resource program. Offered on a satisfactory-fail basis only.

**NREM 115: Explorations in Natural Resource Ecology & Management**

Cr. 1. S.

*Prereq: (Animal Ecology or Forestry major); Permission of Instructor*

Interact with faculty in the Department of Natural Resource Ecology and Management through lectures, discussions, and field experiences. Offered during the second half of Spring semester.

**NREM 120: Introduction to Renewable Resources**

(Cross-listed with AGRON, ENV S). (3-0) Cr. 3. F.S.

Overview of soil, water, plants, and animals as renewable natural resources in an ecosystem context. History and organization of resource management. Concepts of integrated resource management.

**NREM 130: Natural Resources and Agriculture**

(Cross-listed with ENV S). (3-0) Cr. 3. S.

Survey of the ecology and management of fish, forest, and wildlife resources in areas of intensive agriculture, with emphasis on Iowa. Conservation and management practices for private agricultural lands. Designed for nonmajors.

**NREM 207: Natural Resource Management under the North American Model of Conservation**

(1-0) Cr. 1. F.

Introduction to North American model of conservation, current funding for natural resource management, role of hunting and angling in the North American model, critique and refinement of the model for the 21st century, and introduction to natural resource leadership, and outdoor skills and recreation. Offered on a satisfactory-fail basis only.

**NREM 211: Careers in Natural Resources**

Cr. 1. F.S.

*Prereq: Sophomore classification*

Career planning exploration in natural resources. Discussion of the job application process, including techniques for successful interviewing and development of an effective resume. Offered on a satisfactory-fail basis only.

**NREM 240: Quantitative Problem Solving in Natural Resources**

Cr. 3. S.

*Prereq: (STAT 101 or STAT 104) or Permission of Instructor*

Applied quantitative problem-solving skills for natural resource management. Focus on group and individual exercises, with practical problems in geography, hydrology, forestry and ecology. Laboratory includes field data collection and computer data processing and modeling.

**NREM 250: Environmental Geography**

(Cross-listed with AGRON, ENSCI, ENV S). (3-0) Cr. 3. F.

The distribution, origins and functions of the earth's physical systems and the spatial relationship between human activity and the natural world.

**NREM 270: Foundations in Natural Resource Policy and History**

(Cross-listed with ENV S, L A). (3-0) Cr. 3. F.

The development of natural resource conservation philosophy and policy from the Colonial Era to the present. North American wildlife, forestry, and environmental policy; national parks and other protected lands; federal and state agencies. Relationship to cultural contexts, including urban reform and American planning movement. Discussion of common pool resources, public and private lands.

**NREM 301: Natural Resource Ecology and Soils**

(Cross-listed with ENSCI). (3-3) Cr. 4. F.

*Prereq: BIOL 211; BIOL 211L; (FOR 201 or a second course in biology)*

Effects of environmental factors on ecosystem structure and function using forest, prairie and agricultural ecosystems as models. Special emphasis is given to soil-forming factors and the role of soil in nutrient and water cycling and ecosystem dynamics. Additional emphasis is given to human influences on natural ecosystems and the role of perennial plant communities in agricultural landscapes.

**NREM 303: Internship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Permission of Instructor; Sophomore classification*

Placement with county conservation boards, camps, zoos, parks, etc., for experience as interpreters, rangers, and technicians.

**NREM 305: Seminar**

(2-0) Cr. 1-3. Repeatable. F.S.

Current topics in natural resources or related issues.

**NREM 311: Field Ecology in Montana**

Cr. 4. SS.

*Prereq: (BIOL 211; BIOL 211L; BIOL 212; BIOL 212L); Permission of Instructor*  
Fundamental concepts and principles of ecology dealing with organisms, populations, communities, and ecosystems. Taught at NREM's Rod and Connie French Conservation Education Camp in western Montana. Emphasizes hands-on learning of principles and methods in the field.

**NREM 313: Native Land, Water, and Resources**

(Cross-listed with AM IN). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Examines Native land rights, water rights, and natural resources. Topics may include Native relations to landscapes, cultural resources and infrastructure projects, land rights, water usage agreements, and resource policies as they apply to on- and off-reservation Native communities. AM IN 210 recommended.

**NREM 315: Genetics for Natural Resource Managers.**

(3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 212*

Introduction into how genetic techniques and technologies can aid the management of the earth's biotic resources. Topics include an overview of DNA structure, function and inheritance; tools and techniques for measuring genetic diversity; genetic management of wild and captive populations: DNA forensics as management tool. The goal of this course is to prepare managers/biologists to interpret genetic data as they relate to natural resource conservation.

**NREM 318: Introduction to Ecosystems**

(Cross-listed with AGRON, BIOL, ENSCI). (3-0) Cr. 3. S.

*Prereq: 12 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Biological and physical processes affecting material and energy flows in natural and managed ecosystems. Understanding and predicting climate and management impacts on ecosystem services and sustainability.

**NREM 330: Principles of Interpretation**

(2-3) Cr. 3. S.

*Prereq: 6 credits in BIOL*

History, objectives, forms, and techniques of interpretation in the settings of county, state, national parks, and zoos. Principles of effective communication as they apply to natural resource fields including wildlife management, forestry, and wildlife rehabilitation. Planning and use of effective communications and outreach campaigns to manage and conserve natural resources.

**NREM 333: Fisheries Techniques**

(Cross-listed with A ECL). (1-3) Cr. 2. F.

*Prereq: BIOL 212*

Introduction to techniques used in the collection and interpretation of fish population data in the field and in the lab. Course objectives include an understanding of population survey methodology and improving student critical thinking and teamwork skills. Laboratory focuses on field trips and hands-on sampling experience.

**NREM 345: Natural Resource Photogrammetry and Geographic Information Systems**

(Cross-listed with ENSCI). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Measurement and interpretation of aerial photos in resource management. Introduction to Geographic Information Systems (GIS) using ArcGIS including digitizing, development and query of attribute tables, georeferencing, and use of multiple GIS layers in simple spatial analyses.

**NREM 357: Midwestern Prairie Plants**

(1-2) Cr. 1. F.

Offered 1st half semester only. Survey of the major plant families, genera, and representative species of Midwestern prairies with emphasis on plant identification. Prairie management for multiple species of plants and wildlife.

**NREM 380: Field Ecology Research and Teaching**

Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (A ECL 312 or BIOL 312 or ENSCI 312 or NREM 301) or Department Permission*

Students work in teams to conduct ecological research projects at a local field site, and develop related teaching modules/lesson plans. Research and teaching activity objectives, methods, and results are shared with diverse audiences as presentations, written reports, and web-based documents, and used to engage K-12 students and community members via field days and visits to schools and other institutions.

**NREM 385: Natural Resource Policy**

(Dual-listed with NREM 585). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 390: Fire Ecology and Management**

(3-0) Cr. 3. F.

Characteristics and role of fire in forest ecosystems. Major topics covered include fuels, fire weather, fire behavior, fire danger rating systems, fire control, prescribed burning, and fire dynamics in major ecosystem types.

**NREM 402: Watershed Hydrology**

(Dual-listed with NREM 502). (Cross-listed with ENSCI, GEOL, MTEOR).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 407: Watershed Management**

(Dual-listed with NREM 507). (Cross-listed with NREM). (3-3) Cr. 4. S.

*Prereq: 1 course in BIOL*

Managing human impacts on the hydrologic cycle. Field and watershed level best management practices for modifying the impacts on water quality, quantity and timing are discussed. Field project includes developing a management plan using landscape buffers.

**NREM 446: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 546). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 452: Ecosystem Management**

(Dual-listed with NREM 552). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 455: Stream restoration**

(Dual-listed with NREM 555). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 455L: Stream Restoration Lab**

(Dual-listed with NREM 555L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 460: Controversies in Natural Resource Management**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

*Prereq: (A ECL 312 or NREM 301); NREM 120; Junior classification*

Analysis of controversial natural resource issues using a case approach that considers uncertainty and adequacy of information and scientific understanding. Ecological, social, political, economic, and ethical implications of issues will be analyzed.

**NREM 466: Ecosystem Services**

(Dual-listed with NREM 566). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 471: Agroforestry Systems**

(Dual-listed with NREM 571). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**NREM 483: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 583). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 485: Undergraduate Seminar**

Cr. 1. Repeatable, maximum of 2 times. F.S.

*Prereq: Major in Animal Ecology or Forestry; Junior or Senior classification; Permission of Instructor*

Weekly seminars on current research topics in natural resource ecology and management. Style and best practice in oral research communication. Skills and principles for evaluating research merit and quality of technical communication. Offered on a satisfactory-fail basis only.

**NREM 489: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 589). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 489L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 589L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar). Provides practical applications in an environmental context.

**NREM 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Junior or Senior classification; Permission of Instructor*

**NREM 490A: Independent Study: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Junior or Senior classification; Permission of Instructor*

**NREM 490B: Independent Study: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Junior or Senior classification; Permission of Instructor*

**NREM 490E: Independent Study: Entrepreneurship**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Junior or Senior classification; Permission of Instructor*

**NREM 490H: Independent Study: Honors Program**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Junior or Senior classification; Permission of Instructor*

**NREM 496: Travel Course**

(Dual-listed with NREM 596). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 496A: Travel Course: International**

(Dual-listed with NREM 596A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.



**NREM 496B: Travel Course: Domestic**

(Dual-listed with NREM 596B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 498: Cooperative Education**

Cr. 1-3. F.S.SS.

*Prereq: Department Chair Permission*

Required of all cooperative education students. Students must register prior to commencing each work period.

**Courses primarily for graduate students, open to qualified undergraduates:**

**NREM 502: Watershed Hydrology**

(Dual-listed with NREM 402). (Cross-listed with ENSCI, GEOL, MTEOR).

(2-3) Cr. 3. F.

Examination of watersheds as systems, emphasizing the surface components of the hydrologic cycle. Combines qualitative understanding of hydrological processes and uncertainty with quantitative representation. Laboratory emphasizes field investigation and measurement of watershed processes.

**NREM 504: Forest Landscapes, Wildlife, and Silviculture**

(2-3) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Permission of instructor*

Desired forest habitat conditions for fish and wildlife. Silvicultural approaches to protecting/improving such habitats. Focus on key forest elements related to animal species, groups and overall diversity. The lab focuses on team observations and discussions of diverse habitats including one weekend field trip.

**NREM 505: Seminar**

(2-0) Cr. 1-3. Repeatable, maximum of 3 times. F.S.

*Prereq: Permission of instructor or graduate classification*

Current topics in natural resources research and management.

**NREM 533: Erosion and Sediment Transport**

(Cross-listed with A B E, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: C E 372 or GEOL/ENSCI/MTEOR 402, MATH 166 or equivalent*

Soil erosion processes, soil loss equations and their application to conservation planning, sediment properties, initiation of sediment motion and over land flow, flow in alluvial channels and theory of sediment transport, channel stability, reservoir sedimentation, wind erosion, BMPs for controlling erosion.

**NREM 535: Restoration Ecology**

(Cross-listed with EEOB, ENSCI). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 366 or BIOL 474 or graduate standing*

Theory and practice of restoring animal and plant diversity, structure and function of disturbed ecosystems. Restored freshwater wetlands, forests, prairies and reintroduced species populations will be used as case studies.

**NREM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**NREM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**NREM 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**NREM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**NREM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.



**NREM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**NREM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**NREM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NUTRS, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**NREM 546: Integrating GPS and GIS for Natural Resource Management**

(Dual-listed with NREM 446). (Cross-listed with ENSCI). (2-3) Cr. 3. F.

*Prereq: 12 credits in student's major at 300 level or above*

Emphasis on the use of GPS as a data collection tool for GIS. Basic theory of GPS. Use of Global Positioning System technology for spatial data collection and navigation. Post-processing and real-time correction of GPS data. GPS data transfer to GIS for mapping applications. Use of GIS to construct waypoints for use in GPS navigation.

**NREM 552: Ecosystem Management**

(Dual-listed with NREM 452). (Cross-listed with FOR). (2-3) Cr. 3. S.

*Prereq: Junior or Senior classification; (NREM 120 or BIOL 173)*

Principles of planning, regulating, and decision-making associated with public and private lands, with consideration of forest, grassland, wetland, and freshwater aquatic ecosystems. Integrated natural resources management within ecological, social, economic and policy constraints.

**NREM 555: Stream restoration**

(Dual-listed with NREM 455). Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Interdisciplinary introduction to the science and practice of stream restoration, with emphasis on restoring physical and biological integrity and ecosystem services to streams and riparian corridors. Lecture highlights philosophical, scientific, and engineering principles.

**NREM 555L: Stream Restoration Lab**

(Dual-listed with NREM 455L). Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: A ECL 418 or A B E 431 or C E 372 or GEOL 402 or NREM 407*

Introduction to measurement and analysis of stream form and function for restoration and rehabilitation. Includes field data collection, map and image analysis, and computation for assessment of channel stability, biotic integrity, and recovery potential.

**NREM 566: Ecosystem Services**

(Dual-listed with NREM 466). (Cross-listed with ENSCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 15 credits in A ECL, AGRON, BIOL, CHEM, FOR, GEOL, NREM*

Ecosystem services are the societal benefits provided by natural and managed ecosystems. Benefits such as provision of food, purification of air and water, and regulation of climate are essential to human survival and prosperity, but rely upon maintenance of healthy ecosystems. This course will cover the science, policy, and practice of ecosystem services assessment and management, with a special focus on biodiversity, water quality, food production, and climate.

**NREM 570: Advanced Decision-making in Natural Resource Allocation**

(2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: FOR 451 or two courses in economics*

Analytical approach to economic aspects of forest resource management problems. Theory and application of economic decision-making criteria to traditional and modern forest resource management issues. Current problems in the allocation of forest resources.

**NREM 571: Agroforestry Systems**

(Dual-listed with NREM 471). (Cross-listed with SUSAG). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**NREM 583: Science + Design: Interpretation of Natural Resources in Montana**

(Dual-listed with NREM 483). (Cross-listed with ARTGR). Cr. 3. F.

*Prereq: Enrollment in ARTGR major; ARTGR 271 or BIOL 211; Permission of Instructor.*

Interdisciplinary service-learning. Design and production of natural resource related interpretive signs for Montana natural areas. Field-work experience followed by on-campus studio.

**NREM 585: Natural Resource Policy**

(Dual-listed with NREM 385). (3-0) Cr. 3. S.

Development, theory and practice of natural resource policy. Integrative approach with topical policy studies in North American wildlife, forestry, and water. Policy formation, the role of science, introduction to federal law compliance.

**NREM 589: Survey of Remote Sensing Technologies**

(Dual-listed with NREM 489). (Cross-listed with E E, ENSCI, GEOL, MTEOR). (3-0) Cr. 3. F.

Electromagnetic-radiation principles, active and passive sensors, multispectral and hyperspectral sensors, imaging radar, SAR, thermal imaging, lidar. Examples of applications. Also offered online S.

**NREM 589L: Satellite Remote Sensing Laboratory**

(Dual-listed with NREM 489L). (Cross-listed with E E, GEOL, MTEOR). (0-3) Cr. 1. F.

*Prereq: 489L: E E 489 or GEOL 489 or MTEOR 489 or NREM 489, 589L: E E 589 or GEOL 589 or MTEOR 589 or NREM 589*

Processing and analysis of satellite sensor data (optical and radar).

Provides practical applications in an environmental context.

**NREM 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590A: Special Topics: Animal Ecology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 590B: Special Topics: Forestry**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Permission of instructor*

**NREM 593: Workshop**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification*

**NREM 596: Travel Course**

(Dual-listed with NREM 496). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 596A: Travel Course: International**

(Dual-listed with NREM 496A). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students. Meets International Perspectives Requirement.

**NREM 596B: Travel Course: Domestic**

(Dual-listed with NREM 496B). Cr. 1-5. Repeatable, maximum of 3 times.

*Prereq: Permission of Instructor*

Limited enrollment. Extended field trips to study ecological and management topics in varied environments. Location and duration of trips will vary. Pre-trip sessions arranged. Trip expenses paid by students.

**NREM 598: Natural Resource Ecology and Management Teaching Practicum**

Cr. 1. F.S.SS.

*Prereq: Graduate classification as M.S. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present at least one unit of subject matter in a course or extension workshop. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 599: Creative Component**

Cr. arr.

**Courses for graduate students:****NREM 600: Seminar**

Cr. 1. Repeatable. F.S.

Current topics in natural resources research and management.

**NREM 698: Natural Resource Ecology and Management Teaching Practicum**

Cr. 1. F.S.

*Prereq: Graduate classification as a Ph.D. candidate in a NREM major and permission of instructor.*

Graduate student experience in teaching. Student must plan and present substantive subject matter for a minimum of three weeks in lecture and/or laboratory formats, or a series of extension seminars/workshops. Teaching practicum must be documented by the student and approved by the student's POS committee. Offered on a satisfactory-fail basis only.

**NREM 699: Research**

Cr. 1-12. Repeatable, maximum of 12 credits.

# Naval Science (N S)

**Any experimental courses offered by N S can be found at:**

registrar.iastate.edu/faculty-staff/courses/explisting/ (http://  
www.registrar.iastate.edu/faculty-staff/courses/explisting/)

**Courses primarily for undergraduates:**

## **N S 111: Introduction to Naval Science**

(3-0) Cr. 3. F.

Introduction to the organization, regulations, and capabilities of the US Navy, with emphasis on mission and principal warfare components.

## **N S 212: Seapower and Maritime Affairs**

(3-0) Cr. 3. S.

An historical survey of sea power in terms of national domestic environments, foreign policy, and the evolution of maritime forces with trends in technology, doctrine, and tactics. The student will develop an understanding of the role the US Navy has played in the nation's history, both in peace and war. Naval events, forces and policies will be studied as elements in the shaping of the national consciousness and sense of purpose. Course content will include the development of the concept of sea power, the role of various warfare components of the Navy, the implementation of sea power as an instrument of national policy, the evolution of naval tactics, and the influence of maritime affairs around the world.

## **N S 220: Leadership and Management**

(3-0) Cr. 3. F.

Introduction to the basic concepts of management and organization, their application to operations and personnel management. Experiential approach to learning principles of leadership and management by examining various management theories and their applications. Skills are developed in the areas of communication, counseling, control, direction, management, and leadership through active guided participation.

## **N S 230: Navigation**

(3-0) Cr. 3. S.

*Prereq: Sophomore classification*

Study of the fundamentals of marine navigation used by ships at sea; includes practical exercises in piloting using visual and electronic means. In-depth discussion of laws that govern conduct of vessels in national and international waters. Course is supplemented with review and analysis of case studies involving actual navigation incidents.

## **N S 240: Fundamentals of Maneuver Warfare**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: N S 111*

Concepts, definition, and need for maneuver warfare and expeditionary operations. US Marine Corps case studies of specific battles, development, and implementation. Structure, operation and capabilities of the Marine expeditionary unit, Marine air-ground task force and expeditionary strike group, Discussion and incorporation of leadership traits and principles.

## **N S 320: Naval Ship Systems I (Engineering)**

(3-0) Cr. 3. F.

*Prereq: PHYS 231; PHYS 231L; Sophomore classification*

An introduction to naval engineering with emphasis on the equipment and machinery involved in the conversion of energy for propulsion and other purposes aboard the major ship types of the U.S. fleet. Basic concepts of the theory and design of steam, gas turbine, diesel, and nuclear propulsion. Introduction to ship design, stability, hydrodynamic forces, compartmentalization, electrical and auxiliary systems.

## **N S 321: Evolution of Warfare**

(3-0) Cr. 3. S.

*Prereq: Sophomore classification*

Evolution of warfare from 3500 B.C. to contemporary times; analysis of the impact of historical precedents on modern military thought and action; emphasis on the historical development of military tactics, strategy, and technology.

## **N S 330: Naval Ship Systems II (Weapons)**

(3-0) Cr. 3. S.

*Prereq: PHYS 231; Sophomore classification*

Introduction to the theory and principles of operation of naval weapon systems. Included coverage of types of weapons and fire control systems, capabilities and limitations; theory of target acquisition, identification and tracking; basics of naval ordnance.

## **N S 410: Naval Operations and Seamanship**

(3-0) Cr. 3. F.

*Prereq: N S 230; Senior classification*

Study of tactical naval operations; employs practical use of maneuvering boards together with shiphandling principles to arrive at tactical shipboard maneuvering solutions. Study also of naval command and control, communications, and the Naval Warfare Doctrine.

**N S 412: Leadership and Ethics**

(3-0) Cr. 3. S.

*Prereq:* N S 111; (HIST 389 or N S 212); N S 220; N S 230; N S 320; N S 330; N S 410

Basic background concerning the duties and responsibilities of the junior naval officer and division officer in the areas of integrity and ethics, human resources management, personnel management, material management, and the administration of discipline. Preparation for responsibilities encountered immediately upon commissioning.

**N S 440: Senior Naval Science Seminar**

(1-0) Cr. 1. F.S.

*Prereq:* Senior classification

Current leadership issues in the US Navy which will challenge the newly commissioned officer. Opportunities to analyze, provide solutions, and discuss actions related to a variety of real world situations.

**N S 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq:* 6 credits in N S; Permission of Department Chair; Senior classification

No more than 9 credits of N S 490 may be counted toward graduation.

## Neuroscience (NEURO)

**Any experimental courses offered by NEURO can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**NEURO 556: Cellular, Molecular and Developmental Neuroscience**

(Cross-listed with B M S, GDCB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* BIOL 335 or BIOL 436; physics recommended

Fundamental principles of neuroscience including cellular and molecular neuroscience, nervous system development, and regulatory systems.

**NEURO 557: Rotations in Neuroscience**

(Cross-listed with GDCB). (2-0) Cr. 2. F.S.

Rotation experiences in various neuroscience research methods and techniques related to our current faculty specialties.

**NEURO 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with FS HN, GERON, NUTRS, PSYCH). Cr. 2. S.

*Prereq:* Graduate standing, or undergraduate with consent of instructor.

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**Courses for graduate students:**

**NEURO 661: Advanced Topics in Neuroscience**

(Cross-listed with BBMB, GDCB, KIN). (3-0) Cr. 3. Repeatable. Alt. S., offered even-numbered years.

*Prereq:* NEURO 556 (or comparable course) or permission of instructor

Students will present three journal articles and two overview lectures on topics in neuroscience that are related but outside of their own research interest.

**NEURO 696: Neuroscience Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Seminar in neuroscience, current research interests, and/or professional development.

**NEURO 699: Research**

Cr. arr. Repeatable.

## Nursing (NRS)

**Any experimental courses offered by NRS can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**NRS 250: Orientation to RN - to - BSN Nursing**

(1-0) Cr. 1. F.

*Prereq:* NRS A Major or NRS H Major

Prepares the learner for the academic experience. Topics will include an introduction to learner-centered instruction, support services, communication, time management, and evaluation and assessment methods. Requirements of all nursing courses such as APA formatting and citation of sources will also be included. BSN students will successfully complete orientation prior to or concurrent with their first nursing course.

**NRS 320: Essential Concepts for Professional Nursing Practice**

(3-0) Cr. 3. F.

*Prereq: NRS A Major or NRS H Major*

Exploration of the philosophical, conceptual, and theoretical bases for baccalaureate nursing practice. Key concepts impacting the nursing profession and healthcare are examined from both historical and contemporary perspectives. Topics include professional role development, interprofessional collaboration and teamwork, quality and safety, effective communication, and provision of culturally competent and patient-centered care.

**NRS 340: Nursing Research and Evidence-Based Practice**

(4-0) Cr. 4. F.

*Prereq: NRS A Major or NRS H Major*

Introduction to the critical thought processes and methods used in nursing research. Basic concepts and terminology of research methodology and analysis are presented. Theory as a basis for research is examined. Students are given the opportunity to interpret and evaluate nursing research. Strategies for implementation of evidence based nursing practice to support quality and transformation in health care are explored.

**NRS 420: Promoting a Culture of Health and Wellness**

(3-0) Cr. 3. F.

*Prereq: NRS A Major or NRS H Major*

Health promotion and illness prevention across the lifespan are examined in the context of the theoretical foundations, historical and contemporary practice and patient-centered care. Specific and evidence-based guidelines for supporting or improving health and well-being are explored and considered for both care recipients and care givers. Attention is given to the roles of the health care provider and care recipient in screening, communication, and counseling. The use of complementary or alternative therapeutics in assisting clients to achieve goals of health, healing and wellness is explored, as are spiritual and cultural beliefs and practices.

**NRS 440: Population and Community Health Nursing**

(3-0) Cr. 3. S.

*Prereq: NRS 340; NRS 420*

Using nursing process and an evidence-based framework, the student will explore epidemiology and genetics; health promotion and disease prevention within population groups; community assessment and intervention; and factors influencing health services access and delivery in the United States and globally. Individual and family case management, community wellness, healthcare access, health literacy and health education will be considered. This course includes project and simulation based practicum experiences.

**NRS 442: Population and Community Health Nursing Practicum**

Cr. 1-2. F.S.SS.

*Prereq: NRS 440*

Practicum experience to accompany NRS 440. May include project and simulation based practicum experiences, local individual practice experiences and/or group immersion experiences.

**NRS 460: Nursing Leadership and Management**

(3-0) Cr. 3. S.

*Prereq: NRS 320; NRS 340*

Explores the knowledge and skills needed to implement leadership and management roles in various health care settings. Current theories of management, leadership and change are examined and related to nursing practice. Includes effective communication and relationship skills, organizational structure, information management, financial management, quality and outcomes measurement, and teamwork.

**NRS 480: Advanced Concepts of Professional Nursing**

(3-0) Cr. 3.

*Prereq: NRS 440; NRS 460*

Exploration of professional issues in contemporary nursing through published research, professional standards, literature and narrative evidence, with consideration of legal/ethical influences. Discussion of the change agent process and personal empowerment will be applied to resolution of issues. Emphasis on analysis, sources of credible information, advocacy and empowerment that enables the student to further develop leadership abilities, communication, critical thinking, and decision-making skills.

**NRS 490: Independent Study**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.

*Prereq: NRS A Major or NRS H Major*

Independent work in nursing. A maximum of 4 credits of NRS 490 may be used toward graduation.

**NRS 490A: Independent Study: Transition into Professional Practice**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: NRS A Major or NRS H Major*

Independent work in nursing. A maximum of 4 credits of NRS 490 may be used toward graduation.

**NRS 490B: Independent Study: Special Topics in Nursing**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: NRS A Major or NRS H Major*

Independent work in nursing. A maximum of 4 credits of NRS 490 may be used toward graduation.

**NRS 490C: Independent Study: International Experience**

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: NRS A Major or NRS H Major*

Independent work in nursing. A maximum of 4 credits of NRS 490 may be used toward graduation.

## Nutritional Sciences (NUTRS)

*Any experimental courses offered by NUTRS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

### **NUTRS 501: Biochemical and Physiological Basis of Nutrition: Macronutrients and Micronutrients**

(4-0) Cr. 4. F.

*Prereq: Credit or enrollment in BBMB 404 or BBMB 420*

Integration of the molecular, cellular, and physiologic aspects of energy, macronutrient, and micronutrient metabolism in mammalian systems. Survey course that includes interactions among nutrients (dietary carbohydrate, fiber, lipid, protein, vitamins, and minerals) and non-nutrients, metabolic consequences of nutrient deficiencies or excesses, relevant polymorphisms, epigenetics, and major research methodologies.

### **NUTRS 504: Nutrition and Epigenetic Regulation of Gene Expression**

(1-0) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: graduate standing; undergraduate with consent of instructor*

Discussion of epigenetic regulation of gene expression and the role that nutrition plays in this process. Examination of current research literature to understand how different nutrients and physiological states influence epigenetics, as well as, the research methodology used to address these relations.

### **NUTRS 505: Short Course**

(1-0) Cr. 1. Repeatable. SS.

*Prereq: Permission of instructor*

### **NUTRS 518: Digestive Physiology and Metabolism of Non Ruminants**

(Cross-listed with AN S). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: AN S 419 or NUTRS 501*

Digestion and metabolism of nutrients. Nutritional requirements and current research and feeding programs for poultry and swine.

### **NUTRS 520: Digestive Physiology and Metabolism of Ruminants**

(Cross-listed with AN S). (2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: AN S 419 or NUTRS 501*

Digestive physiology and nutrient metabolism in ruminant and peruminant animals.

### **NUTRS 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

### **NUTRS 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

### **NUTRS 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, VDPAM). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

### **NUTRS 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

### **NUTRS 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

### **NUTRS 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.



**NUTRS 542F: Introduction to Molecular Biology Techniques:**

**Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**NUTRS 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, V MPM, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**NUTRS 549: Advanced Vertebrate Physiology I**

(Cross-listed with AN S, KIN). (4-0) Cr. 4. F.

*Prereq: recommended: an undergraduate physiology course and a biochemistry course*

Overview of mammalian physiology. Cell biology, endocrinology, cardiovascular, respiratory, immune, digestive, skeletal muscle and reproductive systems.

**NUTRS 561: Medical Nutrition and Disease I**

(Dual-listed with FS HN 461). (4-0) Cr. 4. F.

*Prereq: (BIOL 256 or BIOL 335); FS HN 360; FS HN 361; FS HN 367*

Pathophysiology of selected chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and improve health.

**NUTRS 563: Community Nutrition and Health**

(3-0) Cr. 3. F.

*Prereq: FS HN 265 or FS HN 360; FS HN 361*

Dual listed with FS HN 463. Survey of current public health nutrition problems among nutritionally vulnerable individuals and groups.

Discussion of the multidimensional nature of those problems and of community programs addressing them. Grant writing as a means for funding community nutrition program development. Significant emphasis on written and oral communication at the lay and professional level.

**NUTRS 564: Medical Nutrition and Disease II**

(4-0) Cr. 4. S.

*Prereq: FS HN 360, FS HN 461, or NUTRS 561.*

(Dual listed with FS HN 464.) Pathophysiology of selected acute and chronic disease states and their associated medical problems. Specific attention will be directed to medical nutrition needs of patients in the treatment of each disease state to optimize nutritional status and promote health.

**NUTRS 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with FS HN, GERON, NEURO, PSYCH). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**Courses for graduate students:**

**NUTRS 618: Vitamins and Minerals**

(Cross-listed with AN S). Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Biochemistry, physiology, basic nutrition*

Understanding molecular aspects of vitamin and mineral metabolism and homeostasis in humans and animals. An in-depth examination of the chemistry of vitamins and minerals, including genetic mutations, proteins involved in absorption and excretion, and their necessity in biological processes.

**NUTRS 619: Advanced Nutrition and Metabolism - Protein**

(Cross-listed with AN S). (2-0) Cr. 2.

*Prereq: BBMB 405*

Digestion, absorption, and intermediary metabolism of amino acids and protein. Regulation of protein synthesis and degradation. Integration of cellular biochemistry and physiology of mammalian protein metabolism.

**NUTRS 620: Advanced Nutrition and Metabolism - Energy**

(Cross-listed with AN S). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405*

Energy constituents of feedstuffs and energy needs of animals as related to cellular biochemistry and physiology. Interpretations of classical and current research.

**NUTRS 680: Modern Views of Nutrition**

Cr. R. Repeatable. F.

Current concepts in nutrition and related fields.

**NUTRS 690: Special Problems**

Cr. arr. Repeatable. F.S.SS.

**NUTRS 695: Grant Proposal Writing**

(Cross-listed with FS HN). (1-0) Cr. 1. F.

*Prereq:* 3 credits of graduate course work in food science and/or nutritional sciences

Grant proposal preparation experiences including writing and critiquing of proposals and budget planning. Understanding the grant funding process from federal, foundation, and commodity agencies. Includes preparing a grant for possible submission and participation in the review of proposals. Discussion of the role of successful grant writing in career development.

**NUTRS 699: Research in Nutritional Sciences**

Cr. arr. F.S.SS.

Offered on a satisfactory-fail basis only.

## Organization for Tropical Studies (OTS)

*Any experimental courses offered by OTS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**OTS 510: Tropical Biology: An Ecological Approach**

Cr. 8.

This course is designed for students in the early stages of graduate study in biology or a related field, with the goal of training graduate students in research methods by providing intensive field experience in diverse tropical ecosystems.

**OTS 515: Topics in Tropical Biology**

Cr. 1-8.

This course is designated for students enrolled in graduate course offerings through OTS (excluding OTS 510). Examples of graduate courses offered by OTS include Tropical Plant Systematics, Tropical Ecology and Conservation, Molecular Methods in Tropical Ecology, and Tropical Agroecology.

## Performing Arts (PERF)

*Any experimental courses offered by PERF can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**PERF 105: Performing Arts Seminar**

(1.5-0) Cr. 0.5. Repeatable, maximum of 6 times. F.S.

Cross-disciplinary exploration of topics in the performing arts taken multiple semesters by Performing Arts majors and minors. Offered on a satisfactory-fail basis only.

**PERF 310: Performing Arts Internship**

Cr. R. Repeatable. F.S.SS.

Required of performing arts majors. A job or internship with a professional or semi-professional performing arts organization. Offered on a satisfactory-fail basis only.

**PERF 401: Performing Arts Capstone Seminar**

(2-0) Cr. 2. S.

*Prereq:* Senior Classification

Collaborative study and practice of topics in the performing arts specifically aimed at preparing students for post-undergraduate life. The course culminates in an individual or group capstone project. Required for performing arts majors.

## Philosophy (PHIL)

*Any experimental courses offered by PHIL can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**PHIL 201: Introduction to Philosophy**

(3-0) Cr. 3. F.S.SS.

It has been rumored that the unexamined life is not worth living. Philosophy is an attempt to begin examining life by considering such questions as: What makes us human? What is the world ultimately like? How should we relate to other people? Is there a god? How can we know anything about these questions? Understanding questions of this kind and proposed answers to them is what this course is all about.

**PHIL 206: Introduction to Logic and Scientific Reasoning**

(3-0) Cr. 3. F.

Basic principles of critical reasoning and argument evaluation. A consideration of basic forms of argumentation in science and everyday life. Application to contemporary issues and controversies.

**PHIL 207: Introduction to Symbolic Logic**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

Introduction to fundamental logical concepts and logical symbolism. Development of natural deduction through first order predicate logic with identity. Applications to arguments in ordinary English and to philosophical issues. Linguistics majors should take LING/PHIL 207 as early as possible.

**PHIL 230: Moral Theory and Practice**

(3-0) Cr. 3. F.S.SS.

Investigation of moral issues in the context of major ethical theories of value and obligation; e.g., punishment, abortion, economic justice, job discrimination, world hunger, and sexual morality. Emphasis on critical reasoning and argument analysis.

**PHIL 235: Ethical Issues in a Diverse Society**

(3-0) Cr. 3. F.S.

This course will examine a range of arguments on diversity issues. Topics will include: the social status of women, the moral status of sexuality and homosexuality, the nature and role of racism in contemporary society, the relationship between biology, gender roles and social status, and various proposals for change from a variety of political perspectives.

Meets U.S. Diversity Requirement

**PHIL 310: Ancient Philosophy**

(Cross-listed with CL ST). (3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Survey of ancient Greek philosophy, focusing on the pre-Socratics, Plato, and Aristotle. Questions concerning being, knowledge, language, and the good life are treated in depth.

**PHIL 314: 17th Century Philosophy**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Readings from philosophers such as Hobbes, Descartes, Spinoza, Leibniz, and Locke. Changing conceptions of knowledge, self, and deities in response to Galileo's new science and post-reformation challenge to ecclesiastical authority.

**PHIL 315: 18th Century Philosophy**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Readings from philosophers such as Berkeley, Hume, and Kant. Development of Enlightenment thought. Issues include idealism, causation, freedom, and knowledge regarding science, ethics, and deities.

**PHIL 316: 19th Century Continental Philosophy**

(3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

The thought of Hegel, Marx, Nietzsche, and their contemporaries. Various perspectives on the philosophy of history, the nature of reason and subjectivity, the contrast between dialectical and nondialectical philosophy, and the relationship between philosophy and society.

**PHIL 318: History of Analytic Philosophy**

(3-0) Cr. 3. S.

*Prereq: 3 credits in PHIL*

Major movements in recent and contemporary philosophy such as realism, logical positivism, ordinary language philosophy, and naturalism. Russell, Wittgenstein, Quine and other leading figures. Topics include knowledge of the material world, mind, language, values, and philosophical method. PHIL 201 recommended.

**PHIL 320: Existentialism**

(3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

History, development and forms of existential thought. Consciousness, free will, authenticity and bad faith. Readings of major figures in existentialism, such as Kierkegaard, Nietzsche, Dostoevsky, Heidegger, Sartre, and de Beauvoir.

**PHIL 330: Ethical Theory**

(3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Study of major theories of morality and the good life. Includes such topics as moral psychology, practical reasoning, and virtue theory.

**PHIL 331: Moral Problems in Medicine**

(3-0) Cr. 3. S.

In-depth study of some of the central moral problems arising in medicine, e.g., abortion, euthanasia, patients' rights, health care professionals' duties and responsibilities, allocation of medical resources. Major moral theories will be examined and applied.

**PHIL 332: Philosophy of Law**

(Cross-listed with C J). (3-0) Cr. 3. F.S.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Extent of our obligation to obey the law; what constitutes just punishment; how much of the immoral should be made illegal? Relation of these questions to major theories of law and the state. Discussion of such concepts as coercion, equality, and responsibility.

**PHIL 334: Environmental Ethics**

(Cross-listed with ENV S). (3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Thorough study of some of the central moral issues arising in connection with human impact on the environment, e.g., human overpopulation, species extinction, forest and wilderness management, pollution. Several world views of the proper relationship between human beings and nature will be explored.

**PHIL 335: Social and Political Philosophy**

(3-0) Cr. 3. F.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Foundational moral issues of social and political life. Topics include justice, political economy, liberty and equality, and democracy, rights, and authority.

**PHIL 336: Bioethics and Biotechnology**

(3-0) Cr. 3.

*Prereq: 3 credits in PHIL or Permission of Instructor*

In-depth study of some central moral issues in the life sciences, e.g., genetic screening and testing, genetically engineered plants and animals, risk analysis, biotechnology patents, research ethics, biodiversity, the impact of biotechnology on society and the environment. Major moral theories will be discussed and applied.

**PHIL 338: Feminist Philosophy**

(Cross-listed with WGS). (3-0) Cr. 3. F.

A critical, theoretical examination of the philosophical and intellectual commitments that underlie feminist projects. Questions of identity, knowledge, and ethics will be considered from both historical and contemporary perspectives. Topics will include sex and gender, self and other, nature and nurture, masculinity and femininity, equity and justice, patriarchy, oppression, and intersectionality. 3 credits in PHIL or WGS recommended.

**PHIL 339: Liberty and Law in America**

(Cross-listed with C J, POL S). (3-0) Cr. 3. F.S.

Competing conceptions of liberty in American political thought. Debates about how liberty should be protected by the law, in fields such as health care, drugs, property, speech, religion, and sex.

**PHIL 340: Aesthetics**

(3-0) Cr. 3. F.

Aesthetic theory and applies it to everyday life. Theoretical topics include the nature of aesthetic experience, criticism, and expression. Aesthetic experience of such forms of art as poetry and painting, as well as interactions with nature, sports, architecture, and campus sculpture.

**PHIL 343: Philosophy of Technology**

(3-0) Cr. 3. F.S.

Moral and other philosophical problems related to developments in technology. Topics may include conditions under which technological innovations contribute to human emancipation, relationship of technology and democracy, utility and limits of technical rationality, and problems of ensuring that benefits of technological advance are communally shared. Topics discussed with reference to such issues as contemporary developments in microelectronics, technology transfer to the Third World, etc.

**PHIL 350: Philosophy of Religion**

(Cross-listed with RELIG). (3-0) Cr. 3. F.

*Prereq: 6 credits in PHIL or Permission of Instructor*

The value and truth of religious life and belief. Mystical experience; religious faith and language; arguments for God's existence; the problem of evil; miracles; and religion and morality. Historical and contemporary readings.

**PHIL 363: Metaphysics in Science Fiction and Popular Culture**

(3-0) Cr. 3.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Examination of metaphysical issues that commonly arise in science fiction and related areas of popular culture, such as the relationship between mind and reality, metaphysical personhood, time, and causation.

**PHIL 364: Metaphysics: God, Minds, and Matter**

(3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or Permission of Instructor*

A survey of classical and contemporary views on some basic metaphysical issues. Issues discussed include: Does God exist? Do you have a mind and, if so, how does it relate to your body? What is the nature of cause and effect? Do objects have any essential properties? How can we account for properties objects have in common?

**PHIL 366: Truth, Belief, and Reason**

(3-0) Cr. 3. F.

*Prereq: 6 credits in PHIL or Permission of Instructor*

This course focuses on significant topics in theory of knowledge, including the value of true beliefs, the role of sense experience in supporting our theoretical views, and the place of reason in human nature. Historical and contemporary views will be considered.

**PHIL 380: Philosophy of Science**

(3-0) Cr. 3. F.

*Prereq: 6 credits in PHIL or Permission of Instructor*

Introduction to the philosophy of science. A variety of basic problems common to the natural and social sciences: the nature of explanation, the structure of theories, the unity of science, and the distinction between science and nonscience.

**PHIL 382: History and Philosophy of the Scientific Revolution**

(Cross-listed with HIST). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 3 credits in PHIL or Permission of Instructor*

The emergence of empirical science as the authoritative methodology for production of knowledge about the natural world in the period between Copernicus and Kant. Scientific progress achieved during the period, including the work of Galileo, Descartes, and Newton. The re-shaping of epistemology in the Western intellectual tradition. Implications for philosophy and historiography.

**PHIL 389: Philosophy of Psychology and Psychiatry**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 3 credits in PHIL or PSYCH, or Permission of Instructor*

Philosophical foundations of 20th century psychology and psychiatry. Introduction to competing schools of thought in psychology and their philosophical assumptions. Examination of philosophical assumptions in the study of psychopathology/abnormal psychology.

**PHIL 410: Soul, Mind, and World in Ancient Greek Philosophy**

(Cross-listed with CL ST). (3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or CL ST, or Permission of Instructor*

Prominent theories of soul and mind developed by Greek philosophers in the classical period, roughly 500 BCE-200 CE, and how the philosophers located these theories within their general metaphysical views. Relationship between mind and body and the roles of reason, desire, and emotion. Philosophers to be studied include Plato, Aristotle, and selected others.

**PHIL 430: Value Theory**

(3-0) Cr. 3. S.

*Prereq: 3 credits in PHIL or Permission of Instructor*

Theoretical and normative topics in ethics or political philosophy.

**PHIL 435: Contemporary Political Philosophy**

(Dual-listed with PHIL 535). (Cross-listed with POL S). (3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or POL S, or Permission of Instructor*

Examination of theories of justice proposed by contemporary political philosophers. Analysis of the philosophical foundations of perspectives such as egalitarianism, libertarianism, and socialism. Normative assessment of social and political institutions.

**PHIL 450: Agency and Free Will**

(3-0) Cr. 3. F.

Personal identity, agency, free will, moral responsibility, causation, future contingents, and time will be discussed. What makes a person the same person over time? Do humans have free will? Are we not morally responsible if our actions are inevitable consequences of the past and the laws of nature? What distinguishes causes from non-causes? Are there facts about the future? PHIL 207 strongly encouraged.

**PHIL 465: Brains, Minds, and Computers**

(3-0) Cr. 3. F.

Examination of concepts such as computability, intelligence, programming, and free will; and of arguments about whether any human capacity is forever beyond realization in a machine. 3 credits in PHIL recommended.

**PHIL 466: Topics in Epistemology**

(3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or Permission of Instructor*

Topics in epistemology. Possible topics include skepticism about the external world, the extent of a priori knowledge, rival accounts of moral knowledge, feminist perspectives on the theory of knowledge, and the value of true belief. Topics vary each time offered.

**PHIL 485: Philosophy of Physics**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in PHIL or PHYS, or Permission of Instructor*

Conceptual and philosophical issues relating to the interpretation of theories in classical and modern physics. May include one or more of the following topics: the relationship between mathematics and the physical world; Newtonian physics (determinism and predictability); thermodynamics and statistical physics (the nature of probability; entropy and the direction of time); relativistic physics (indeterminism; realism and nonlocality; consciousness and the role of the observer).

**PHIL 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in PHIL; Permission of Instructor*

Guided reading and research on special topics selected to meet needs of advanced students. No more than 9 credits of PHIL 490 may be counted toward graduation.

**PHIL 490H: Independent Study, Honors**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in PHIL; Permission of Instructor*

Guided reading and research on special topics selected to meet needs of advanced students. No more than 9 credits of PHIL 490 may be counted toward graduation.

**PHIL 492: Graduating Senior Survey**

Cr. R. F.S.

*Prereq: Senior classification*

Final presentation for graduation and the future. Outcomes assessment activities. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PHIL 535: Contemporary Political Philosophy**

(Dual-listed with PHIL 435). (Cross-listed with POL S). (3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or POL S, or Permission of Instructor*

Examination of theories of justice proposed by contemporary political philosophers. Analysis of the philosophical foundations of perspectives such as egalitarianism, libertarianism, and socialism. Normative assessment of social and political institutions.

**PHIL 590: Special Topics in Philosophy**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor, 9 credits in philosophy***PHIL 590A: Special Topics in Philosophy: History of Philosophy**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor, 9 credits in philosophy***PHIL 590B: Special Topics in Philosophy: Epistemology and Metaphysics**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor, 9 credits in philosophy***PHIL 590C: Special Topics in Philosophy: Value Theory**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor, 9 credits in philosophy***PHIL 590D: Special Topics in Philosophy: Logic and Philosophy of Science**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor, 9 credits in philosophy***PHIL 593: Summer Bioethics Workshop for Teachers**

(2-0) Cr. 2. SS.

Topics include moral theory, pedagogical issues in teaching bioethics, and substantive current issues in bioethics.

## Physics (PHYS)

*Any experimental courses offered by PHYS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**PHYS 050: Preparation for Introductory Physics**

Cr. 0. F.S.

An in#depth active learning experience designed to impart the fundamental concepts and principles of physics, with an emphasis on applied mathematical techniques and logical thinking. For students intending to enroll in classical physics (PHYS 231/232) who have not taken high school physics, who have not had a high school college preparatory physics course, or who need a review of physics problem solving and physics concepts. 1 year high school algebra recommended. Credit for Phys 50 does not count toward graduation.

**PHYS 101: Physics for the Nonscientist**

(3-0) Cr. 3. F.S.

Survey of the principal areas of both classical and modern physics. Emphasis on the nature of the physical universe and the application of physical principles to life in the modern world. Not suitable to meet a general physics requirement for natural science majors.

**PHYS 102L: Physical Sciences for Elementary Education**

(Cross-listed with CHEM). (1-4) Cr. 3. F.S.

*Prereq: MATH 140 or MATH 195*

Physical science principles for future elementary teachers. Emphasis on experiments that address current elementary science education standards and that are appropriate for their future students to do, such as measurements of mass, length, time, light from atoms, charge and current, motion due to forces, energy and work, heat, waves, optics, building bridges and making musical instruments, studying states of matter and chemical reactions.

**PHYS 115: Physics for the Life Sciences**

(4-0) Cr. 4. F.S.

Emphasis on basic physics principles applied to biological problems. Topics include mechanics, fluids, thermodynamics, heat, light, sound, electricity and magnetism. A coordinated laboratory, Physics 115 laboratory is available. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 115L: Laboratory in Physics for the Life Sciences**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in PHYS 115*

Experiments related to the elementary topics of physics for the life sciences. Mechanics, fluids, thermodynamics, heat, light, sound, electricity and magnetism.

**PHYS 131: General Physics I**

(4-0) Cr. 4. F.S.SS.

General background in physical concepts, principles, and methods for those who do not plan advanced study in physics or engineering. Mechanics, fluids, heat and thermodynamics, vibrations, waves, sound. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 131L: General Physics I Laboratory**

(0-2) Cr. 1. F.S.SS.

Laboratory experiments in elementary kinematics, work and energy, conservation laws, rotational motion, waves and fluids. 1.5 yr. HS algebra, 1 yr. HS geometry, 1 semester HS trigonometry recommended.

**PHYS 132: General Physics II**

(4-0) Cr. 4. F.S.SS.

*Prereq: PHYS 111 or PHYS 131*

General background in physical concepts, principles, and methods for those who do not plan advanced study in physics or engineering. Electricity and magnetism, ray and wave optics, topics in modern physics.



**PHYS 132L: General Physics II Laboratory**

(0-2) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in PHYS 112 or PHYS 132*

Laboratory experiments in Electricity and Magnetism, Wave and Optics.

**PHYS 199: Introductory Seminar**

(1-1) Cr. 1. F.

Gain experience in key skills that physicists/astronomers use routinely, but are rarely explicitly taught in formal courses. Participate in faculty-led discussions on frontier areas and careers. Offered on a satisfactory-fail basis only.

**PHYS 231: Introduction to Classical Physics I**

(4-0) Cr. 4. F.S.SS.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

For engineering and science majors. 3 hours of lecture each week plus 3 recitations every two weeks. Elementary mechanics including kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation. Heat, thermodynamics, kinetic theory of gases; waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 231H: Introduction to Classical Physics I: Honors**

(4-0) Cr. 4. F.S.SS.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

For engineering and science majors. 3 hours of lecture each week plus 3 recitations every two weeks. Elementary mechanics including kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation. Heat, thermodynamics, kinetic theory of gases; waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 231L: Introduction to Classical Physics I Laboratory**

Cr. 1. F.S.SS.

*Prereq: MATH 165; credit or concurrent enrollment in PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H*

Laboratory experiments in elementary kinematics, work and energy, conservation laws, and rotational motion. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 232: Introduction to Classical Physics II**

(4-0) Cr. 4. F.S.SS.

*Prereq: MATH 166; PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H*

3 hours of lecture each week plus 1 recitation each week. Fluid dynamics. Electric forces and fields. Electrical currents; DC circuits. Magnetic forces and fields; LR, LC, LCR circuits; Maxwell's equations; wave optics.

**PHYS 232H: Introduction to Classical Physics II: Honors**

(4-0) Cr. 4. F.S.

*Prereq: MATH 166; PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H*

3 hours of lecture each week plus 1 recitation each week. Fluid dynamics. Electric forces and fields. Electrical currents; DC circuits; Magnetic forces and fields; LR, LC, LCR circuits; Maxwell's equations; wave optics.

**PHYS 232L: Introduction to Classical Physics II Laboratory**

(0-2) Cr. 1. F.S.SS.

*Prereq: Credit or concurrent enrollment in PHYS 222 or PHYS 222H or PHYS 232 or PHYS 232H or PHYS 242 or PHYS 242H*

Laboratory experiments in fluid dynamics, electric forces and fields, electrical currents, DC circuits, magnetic forces and fields, and wave optics.

**PHYS 241: Principles and Symmetries in Classical Physics I**

(4.5-1) Cr. 5. F.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

Covers all of mechanics; kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation, and extremum principles. Topics in kinetic theory, thermodynamics, waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 241H: Principles and Symmetries in Classical Physics I, Honors.**

(4.5-1) Cr. 5. F.

*Prereq: MATH 165; credit or concurrent enrollment in MATH 166*

Covers all of mechanics; kinematics and dynamics of particles, work and energy, linear and angular momentum, conservation laws, rotational motion, oscillations, gravitation, and extremum principles. Topics in kinetic theory, thermodynamics, waves and sound. Proficiency in algebra, trigonometry, vector manipulation required.

**PHYS 242: Principles and Symmetries in Classical Physics II**

(4-2) Cr. 5. S.

*Prereq: (PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H); credit or concurrent enrollment in MATH 166*

Fluid dynamics, electrostatics, potentials and fields, currents, fields of moving charges, the magnetic field, electromagnetic induction, DC and AC circuits, Maxwell's equations and electromagnetic waves, electric and magnetic fields in matter. Topics in optics and special relativity.

**PHYS 242H: Principles and Symmetries in Classical Physics II, Honors**  
(4-2) Cr. 5. S.

*Prereq:* (PHYS 221 or PHYS 221H or PHYS 231 or PHYS 231H or PHYS 241 or PHYS 241H); credit or concurrent enrollment in MATH 166

Fluid dynamics, electrostatics, potentials and fields, currents, fields of moving charges, the magnetic field, electromagnetic induction, DC and AC circuits, Maxwell's equations and electromagnetic waves, electric and magnetic fields in matter. Topics in optics and special relativity.

**PHYS 290: Independent Study**

Cr. 1-4. Repeatable.

*Prereq:* Permission of Instructor

**PHYS 299: Intermediate Seminar**

(1-0) Cr. 1-2. S.

Conduct research or an independent study on topics in physics and astronomy. Learn science communication skills that physicists and astronomers use routinely. Offered on a satisfactory-fail basis only.

**PHYS 302: The Challenge of Contemporary Physics**

(3-0) Cr. 3. S.

*Prereq:* Sophomore classification

A largely nonmathematical but intellectually challenging exploration of physics, which assumes no previous work in the field. Selected material from classical and modern physics establishes the conceptual framework for the study of major areas of contemporary physics, culminating in the discussion of topics at the frontier of present knowledge. Topics vary yearly and may include quarks, lasers, superconductivity, fission and fusion, solid state devices, gravitational waves, string theory, facilities, left handed materials, and quantum computing. Not suitable to meet a general physics requirement for natural science majors.

**PHYS 304: Thermal Physics**

(3-0) Cr. 3. S.

*Prereq:* (MATH 266 or MATH 267); ([PHYS 222 or PHYS 222H] or [PHYS 232 or PHYS 232H; PHYS 232L] or [PHYS 242 or PHYS 242H])

Concepts of temperature, entropy, and other characteristic thermodynamic functions, with application to macroscopic properties of matter. The laws of thermodynamics. Introduction to statistical mechanics, including quantum statistics. Application to black body radiation, crystalline vibrations, magnetic ions in solids, electronic heat capacity of metals. Phase transformations and chemical reactions.

**PHYS 306: Physics of Wave Motion**

(3-0) Cr. 3. S.

*Prereq:* Credit or concurrent enrollment in (MATH 266 or MATH 267); (PHYS 222 or PHYS 222H or [PHYS 232; PHYS 232L] or PHYS 242 or PHYS 242H)

Oscillating systems including damped and forced oscillations; fluids, geometric optics, water waves, the wave equation, Fourier and Laplace transforms, non-uniform media, cylindrical and spherical waves, polarization, interference and diffraction, transmission lines, non-linear waves.

**PHYS 310: Electronic Instrumentation for Experimental Physics**

(2-4) Cr. 4. F.

*Prereq:* MATH 166; ([PHYS 222 or PHYS 222H] or [PHYS 232 or PHYS 232H; PHYS 232L] or [PHYS 242 or PHYS 242H])

Common electrical instruments; power supplies; transducers; passive and active devices, analog integrated circuits, including filters and amplifiers; digital integrated circuits; signal transmission and enhancement.

**PHYS 311: Intermediate Laboratory**

Cr. 1-2. Repeatable. S.

*Prereq:* PHYS 322

Experiments in classical and modern physics performed independently by each student.

**PHYS 311T: Intermediate Laboratory for Secondary Physics Teachers**

(0-6) Cr. 3. Repeatable. S.

*Prereq:* PHYS 112 or (PHYS 132; PHYS 132L) or PHYS 222 or PHYS 222H or (PHYS 232 or PHYS 232H; PHYS 232L) or PHYS 242 or PHYS 242H

Experiments in classical and modern physics performed independently by each student. For students preparing for a career in high school teaching.

**PHYS 321: Introduction to Modern Physics I**

(3-0) Cr. 3. F.

*Prereq:* Credit or concurrent enrollment in (MATH 266 or MATH 267); ([PHYS 222 or PHYS 222H] or [PHYS 232; PHYS 232L] or [PHYS 242 or PHYS 242H])

Quantum nature of matter: photons, de Broglie's postulate: wave-like properties of matter; Bohr's model of hydrogen atom; Schrodinger equations in one dimension: energy quantization; detailed solutions for potential steps, barriers and wells; one-electron atoms, spin and magnetic interactions; ground states, optical and x-ray excitations of multi-electron atoms.

**PHYS 321L: Introductory Laboratory in Modern Physics I**

(0-2) Cr. 1. F.

*Prereq:* Credit or concurrent enrollment in PHYS 321

Experiments related to the foundations of modern physics. The dual wave and particle character of electrons and photons, statistics, interferometry and x-ray spectroscopy.

**PHYS 322: Introduction to Modern Physics II**

(3-0) Cr. 3. S.

*Prereq: PHYS 321*

Quantum statistics; lasers; physics of molecules. Properties of solids, including electron band structure, superconductivity and magnetism. Nuclear physics, including nuclear sizes and masses, stability, decay modes, reactions, fission and fusion. Elementary particles, including strangeness, charm, and quarks. Fundamental forces of nature.

**PHYS 322L: Introductory Laboratory in Modern Physics II**

(0-2) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in PHYS 322*

Experiments related to the foundations of modern physics. Radioactive decay, elementary particles, Hall effect, quantization, spectroscopy, statistics and instrumentation.

**PHYS 361: Classical Mechanics**

(3-0) Cr. 3. S.

*Prereq: MATH 265; credit or concurrent enrollment in (MATH 266 or MATH 267); ([PHYS 222 or PHYS 222H] or [PHYS 232 or PHYS 232H; PHYS 232L] or [PHYS 242 or PHYS 242H])*

Newtonian mechanics including forced oscillations, central forces and orbital motion, collisions, moving frames of reference, Lagrange's equations.

**PHYS 362: Intermediate Mechanics**

(3-0) Cr. 3. F.

*Prereq: PHYS 361*

Rigid body motion; small oscillations, normal modes. Special relativity including length contraction, time dilation, simultaneity, Lorentz transformation, 4-vector covariant formalism, relativistic mechanics.

**PHYS 364: Electricity and Magnetism I**

(3-0) Cr. 3. F.

*Prereq: (MATH 266 or MATH 267); ([PHYS 222 or PHYS 222H] or [PHYS 232 or PHYS 232H; PHYS 232L] or [PHYS 242 or PHYS 242H])*

Static electric and magnetic fields, potential theory; electromagnetism, Maxwell's equations.

**PHYS 365: Electricity and Magnetism II**

(3-0) Cr. 3. S.

*Prereq: MATH 385; PHYS 364*

Relativistic electromagnetic theory; radiation and propagation of electromagnetic waves; interaction with matter.

**PHYS 399: Seminar on Secondary School Physics**

Cr. 1-2. Repeatable, maximum of 2 credits. S.

*Prereq: Permission of Instructor*

Review of materials and curricula for secondary school physics presented and discussed by members of the class. Required for approval to teach physics in secondary schools.

**PHYS 421: Ultrafast Laser Science and Spectroscopy**

(Dual-listed with PHYS 521). (3-0) Cr. 3. F.

*Prereq: (PHYS 321; PHYS 365) or Permission of Instructor*

Introduction to ultrafast lasers, nonlinear optics, and their applications. Topics selected from: basic optics, atom-photon interactions, electrodynamics of condensed matter, laser physics, ultrafast and nonlinear optics, ultrashort pulse generation, broadband pulse generation, time-resolved spectroscopy and instrumentation.

**PHYS 422: Foundations of Quantum Computing**

(Dual-listed with PHYS 522). (3-0) Cr. 3. S.

*Prereq: (MATH 207 or MATH 317) or Permission of Instructor*

Overview of quantum computation and quantum information processing from a physics perspective. Introduction to classical computation; primer on quantum mechanics; quantum circuits and quantum algorithms; physical realizations; applications and near-term quantum algorithms.

**PHYS 432: Molecular and Cell Biophysics**

(Dual-listed with PHYS 532). (3-0) Cr. 3. S.

*Prereq: CHEM 325 or PHYS 304*

Quantitative description of biological systems using basic physical laws, including a brief discussion of a variety of biophysical techniques. Topics include: thermodynamics, chemical equilibrium, gene expression, structure and physical properties of nucleic acids and proteins, folding of nucleic acids and proteins, chemical kinetics, catalysis, allosteric enzymes, cell membrane structure and physical properties, and machines in cell membranes.

**PHYS 450: Undergraduate Research**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Theoretical research under supervision of physics faculty.

**PHYS 450L: Undergraduate Research**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: PHYS 322L; Permission of Instructor*

Laboratory project under supervision of physics faculty.

**PHYS 461: Physics of Biomolecules**

(Dual-listed with PHYS 561). (3-0) Cr. 3. F.

*Prereq: (BBMB 301; [CHEM 325 or PHYS 304]) or Permission of Instructor*

Cell and Molecular Biophysics. Physical techniques used to characterize the structure, dynamics and properties of biomolecules with emphasis on single molecule techniques.

**PHYS 470L: Applied Physics Laboratory**

Cr. 2-5. Repeatable. F.S.SS.

*Prereq: PHYS 322; Permission of Instructor*

Studies in modern experimental techniques via experimentation and simulation in various areas of applied physics, e.g. superconductivity, optical spectroscopy, nuclear magnetic resonance, electron spin resonance, x-ray diffraction, and computation of electronic and structural properties of matter.

**PHYS 480: Quantum Mechanics I**

(3-0) Cr. 3. F.

*Prereq: MATH 385; PHYS 321*

First semester of a full-year course. A systematic development of the formalism and applications of quantum mechanics. Solutions to the time independent Schrodinger equation for various one-dimensional potentials including the harmonic oscillator; operator methods; Heisenberg picture; angular momentum; the hydrogen atom; spin; symmetry properties.

**PHYS 481: Quantum Mechanics II**

(3-0) Cr. 3. S.

*Prereq: PHYS 480*

Continuation of 480. Addition of angular momentum; charged particles in electromagnetic fields; time-independent perturbation theory; variational principles; WKB approximation; interaction picture; time-dependent perturbation theory; adiabatic approximation; scattering; selected topics in radiation theory; quantum paradoxes.

**PHYS 490: Independent Study**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in PHYS; Permission of Instructor*

No more than 9 credits of Phys 490 may be counted toward graduation.

**PHYS 490H: Independent Study, Honors**

Cr. 1-4. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in PHYS; Permission of Instructor*

No more than 9 credits of Phys 490 may be counted toward graduation.

**PHYS 496: Modern Optics**

(Cross-listed with E E). (3-0) Cr. 3. F.

*Prereq: Credit or concurrent enrollment in (PHYS 322; PHYS 365; PHYS 480)*

Review of wave and electromagnetic theory; topics selected from: reflection/refraction, interference, geometrical optics, Fourier analysis, dispersion, coherence, Fraunhofer and Fresnel diffraction, holography, quantum optics, nonlinear optics.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PHYS 501: Oral Communication of Physics Seminar**

(2-0) Cr. 1. Repeatable. F.

A practical introduction to communication methods in physics and astronomy classrooms and professional settings. For graduate physics majors only. Offered on a satisfactory-fail basis only.

**PHYS 502: Introductory Research Seminar**

Cr. R. F.

(1-1) Discussion by research staff of their research areas, expected thesis research work, and opportunities in the field. For graduate physics majors only. Offered on a satisfactory-fail basis only.

**PHYS 511: Condensed Matter Physics I**

(3-0) Cr. 3. F.

*Prereq: PHYS 304, credit or enrollment in PHYS 481*

First semester of a full-year course. Free electron model; crystal symmetry; band theory of solids; transport properties; Fermi surface; phonons; semiconductors; crystal surfaces; magnetism; superconductivity.

**PHYS 512: Condensed Matter Physics II**

(3-0) Cr. 3. S.

*Prereq: PHYS 511*

Continuation of 511. Free electron model; crystal symmetry; band theory of solids; transport properties; Fermi surface; phonons; semiconductors; crystal surfaces; magnetism; superconductivity.

**PHYS 521: Ultrafast Laser Science and Spectroscopy**

(Dual-listed with PHYS 421). (3-0) Cr. 3. F.

*Prereq: (PHYS 321; PHYS 365) or Permission of Instructor*

Introduction to ultrafast lasers, nonlinear optics, and their applications. Topics selected from: basic optics, atom-photon interactions, electrodynamics of condensed matter, laser physics, ultrafast and nonlinear optics, ultrashort pulse generation, broadband pulse generation, time-resolved spectroscopy and instrumentation.

**PHYS 522: Foundations of Quantum Computing**

(Dual-listed with PHYS 422). (3-0) Cr. 3. S.

*Prereq: (MATH 207 or MATH 317) or Permission of Instructor*

Overview of quantum computation and quantum information processing from a physics perspective. Introduction to classical computation; primer on quantum mechanics; quantum circuits and quantum algorithms; physical realizations; applications and near-term quantum algorithms.

**PHYS 526: Particle and Nuclear Physics**

(4-0) Cr. 4. F.

*Prereq: Credit or enrollment in PHYS 481*

Basic properties and structures of nuclei, hadrons, and elementary particles; weak and strong interactions; the Standard Model; accelerators and detectors; nuclear models; nuclear decay and stability; nuclear astrophysics; the Higgs mechanism; the CKM matrix; running coupling constants; relativistic heavy-ion collisions; selected topics beyond the standard model such as SUSY and grand unification.

**PHYS 528: Mathematical Methods for the Physical Sciences**

(3-0) Cr. 3. F.

*Prereq: MATH 266 or MATH 267*

Fast-paced coverage of mathematical techniques needed for advanced analysis in the physical sciences, particularly for quantum mechanics and electrodynamics. Linear vector spaces and operators. Linear differential equations for time-evolution and steady-state problems, Green's functions and propagators, Sturm-Liouville problems. Functions of a complex variable, calculus of residues, series expansions, integral transforms and applications.

**PHYS 531: Statistical Mechanics**

(3-0) Cr. 3. S.

*Prereq: PHYS 304 and credit or enrollment in PHYS 481, credit or enrollment in MATH 365 or PHYS 528*

Thermodynamic properties of systems of many particles obeying Boltzmann, Fermi-Dirac, and Bose-Einstein statistics; microcanonical, canonical, and grand canonical ensembles and their application to physical problems; density matrices; introduction to phase transitions; renormalization group theory; kinetic theory and fluctuations.

**PHYS 532: Molecular and Cell Biophysics**

(Dual-listed with PHYS 432). (3-0) Cr. 3. S.

*Prereq: CHEM 325 or PHYS 304*

Quantitative description of biological systems using basic physical laws, including a brief discussion of a variety of biophysical techniques. Topics include: thermodynamics, chemical equilibrium, gene expression, structure and physical properties of nucleic acids and proteins, folding of nucleic acids and proteins, chemical kinetics, catalysis, allosteric enzymes, cell membrane structure and physical properties, and machines in cell membranes.

**PHYS 534: Symmetry and Group Theory in Physics**

(3-0) Cr. 3. F.

*Prereq: Credit or enrollment in PHYS 481*

Theory of groups and group representations; introduction to both point and continuous groups, and their applications in physics.

**PHYS 535: Physics of Semiconductors**

(Cross-listed with E E). (3-3) Cr. 4.

*Prereq: E E 311 and E E 332*

Basic elements of quantum theory, Fermi statistics, motion of electrons in periodic structures, crystal structure, energy bands, equilibrium carrier concentration and doping, excess carriers and recombination, carrier transport at low and high fields, space charge limited current, photo-conductivity in solids, phonons, optical properties, amorphous semiconductors, heterostructures, and surface effects. Laboratory experiments on optical properties, carrier lifetimes, mobility, defect density, doping density, photo-conductivity, diffusion length of carriers.

**PHYS 536: Physics of Semiconductor Devices**

(Cross-listed with E E). (3-0) Cr. 3.

*Prereq: E E 535*

P-n junctions, band-bending theory, tunneling phenomena, Schottky barriers, heterojunctions, bipolar transistors, field-effect transistors, negative-resistance devices and optoelectronic devices.

**PHYS 541: General Relativity**

(3-0) Cr. 3. F.

*Prereq: PHYS 362, MATH 207 or MATH 317*

Tensor analysis and differential geometry developed and used to formulate Einstein field equations. Schwarzschild and Kerr solutions. Other advanced topics may include gravitational radiation, particle production by gravitational fields, alternate gravitational theories, attempts at unified field theories, cosmology.

**PHYS 551: Computational Physics**

(0-4) Cr. 3. S.

*Prereq: PHYS 365, credit or enrollment in PHYS 481, some computer programming experience.*

Use of computational methods to solve complex problems in physics and carry out data analysis.

**PHYS 561: Physics of Biomolecules**

(Dual-listed with PHYS 461). (3-0) Cr. 3. F.

*Prereq: (BBMB 301; [CHEM 325 or PHYS 304]) or Permission of Instructor*

Cell and Molecular Biophysics. Physical techniques used to characterize the structure, dynamics and properties of biomolecules with emphasis on single molecule techniques.

**PHYS 564: Advanced Classical Mechanics**

(3-0) Cr. 3. S.

*Prereq: PHYS 362, PHYS 528*

Variational principles, Lagrange's equations, Hamilton's canonical equations, canonical transformations, Hamilton-Jacobi theory, infinitesimal transformations, classical field theory, canonical perturbation theory, classical chaos.

**PHYS 571: Electricity and Magnetism I**

(3-0) Cr. 3. F.

*Prereq: PHYS 365, PHYS 528*

Electrostatics, magnetostatics, boundary value problems, Maxwell's equations, wave phenomena in macroscopic media, wave guides.

**PHYS 572: Electricity and Magnetism II**

(3-0) Cr. 3. S.

*Prereq: PHYS 571*

Special theory of relativity, least action and motion of charged particles in electromagnetic fields, radiation, collisions between charged particles, multipole fields, radiation damping.

**PHYS 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590A: Nuclear Physics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590B: Condensed Matter Physics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590C: High Energy Physics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590D: Physics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590E: Applied Physics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 590F: Biophysics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

Topics of current interest.

**PHYS 591: Quantum Physics I**

(4-0) Cr. 4. F.

*Prereq: PHYS 481*

First semester of a full-year course. Postulates of quantum mechanics; time-dependent and time-independent Schrodinger equations for one-, two-, and three-dimensional systems; theory of angular momentum; Rayleigh-Schrodinger time-independent perturbation theory.

**PHYS 592: Quantum Physics II**

(4-0) Cr. 4. S.

*Prereq: PHYS 591*

Continuation of 591. Variational theorem and WKB method; time-dependent perturbation theory and 2nd quantization of the EM field in Coulomb gauge; method of partial waves and Born approximation for scattering by central potentials; identical particles and symmetry; Dirac and Klein-Gordon equation for free particles; path integral formalism.

**PHYS 599: Creative Component**

Cr. arr.

*Prereq: Permission of instructor*

Individually directed study of research-level problems for students electing the nonthesis M.S. degree option.

**Courses for graduate students:****PHYS 611: Quantum Theory of Condensed Matter**

(3-0) Cr. 3. S.

*Prereq: PHYS 512 and PHYS 681 or permission of instructor.*

Quantum theory of interacting many body systems: zero temperature field theory, Fermi systems, finite temperature field theory, superconductivity and superfluidity. Gauge theories and topological phases of matter: lattice gauge theory, quantum hall effect, and topological field theories.

**PHYS 624: Advanced Nuclear Physics**

(3-0) Cr. 3.

*Prereq: PHYS 526 and PHYS 592*

Microscopic few-body and many-body theory; theory of effective Hamiltonians; relativistic nuclear physics; nuclear effects in hadron-nucleus, lepton-nucleus, and nucleus-nucleus reactions.



**PHYS 625: Physics of Strong Interactions**

(3-0) Cr. 3.

*Prereq: PHYS 681*

Quark model; Quantum Chromodynamics (QCD); perturbation methods for QCD; effective field theories for pions and nucleons; finite temperature field theories; quark-gluon plasma; phase transitions in QCD.

**PHYS 637: Elementary Particle Physics I**

(3-0) Cr. 3. S.

*Prereq: PHYS 526 and PHYS 592*

First semester of a full year course. Properties of leptons, bosons, and quarks and their interactions; quantum chromodynamics, Glashow-Weinberg-Salam model, grand unification theories, supersymmetry; modern theoretical techniques and tests of the Standard Model.

**PHYS 638: Elementary Particle Physics II**

(3-0) Cr. 3.

*Prereq: PHYS 637*

Continuation of 637. Properties of leptons, bosons, and quarks and their interactions; quantum chromodynamics, Glashow-Weinberg-Salam model, grand unification theories, supersymmetry, and superstring theory; modern theoretical techniques.

**PHYS 646: Mathematical Modeling of Complex Physical Systems**

(Cross-listed with MATH). (3-0) Cr. 3. S.

Modeling of the dynamics of complex systems on multiple scales: Classical and dissipative molecular dynamics, stochastic modeling and Monte-Carlo simulation; coarse grained nonlinear dynamics, interface propagation and spatial pattern formation.

**PHYS 650: Advanced Seminar**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650A: Nuclear Physics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650B: Condensed Matter Physics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650C: High Energy Physics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650D: Physics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650E: Applied Physics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 650F: Biophysics**

(1-0) Cr. 1. Repeatable. F.S.

Topics of current interest. Offered on a satisfactory-fail basis only.

**PHYS 660: Advanced Topics in Physics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 660B: Condensed Matter Physics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 660C: High Energy Physics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 660D: Physics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 660E: Applied Physics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 660F: Biophysics**

Cr. 1-3. Repeatable. F.S.

Courses on advanced topics and recent developments.

**PHYS 681: Quantum Field Theory I**

(3-0) Cr. 3. F.

*Prereq: PHYS 564, PHYS 572, PHYS 592*

Quantization of fields (canonical and path integral); Feynman rules; introduction to gauge theories; Quantum Electrodynamics; radiative corrections; renormalization and renormalization group.

**PHYS 682: Quantum Field Theory II**

(3-0) Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: PHYS 681*

Continuation of 681. Systematics of renormalization; renormalization group methods; symmetries; spontaneous symmetry breaking; non-abelian gauge theories; the Standard Model and beyond; special topics.

**PHYS 699: Research**

Cr. arr. Repeatable.

*Prereq: Instructor permission required.*

Graduate research.

## Plant Biology (PLBIO)

**Any experimental courses offered by PLBIO can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

### PLBIO 513: Plant Metabolism

(Cross-listed with GDCB). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BIOL 330, PHYS 131, CHEM 331; one semester of biochemistry recommended*

Photosynthesis, respiration, and other aspects of plant metabolism.

### PLBIO 545: Plant Molecular, Cell and Developmental Biology

(Cross-listed with GDCB, MCDB). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Biol 313, BIOL 314, BIOL 330 or BBMB 405*

Plant nuclear and organelle genomes; regulation of gene expression; hormone signaling; organization, function, and development of plant cells and subcellular structures; regulation of plant growth and development.

**Courses for graduate students:**

### PLBIO 696: Research Seminar

(Cross-listed with AGRON, BBMB, FOR, GDCB, HORT). Cr. 1. Repeatable. F.S.

Research seminars by faculty and graduate students. Offered on a satisfactory-fail basis only.

### PLBIO 699: Research

Cr. arr. Repeatable.

## Plant Pathology (PL P)

**Any experimental courses offered by PL P can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

### PL P 408: Principles of Plant Pathology

(Dual-listed with PL P 508). (2-2) Cr. 3. F.S.

*Prereq: (BIOL 211 or BIOL 212); 4 additional credits in life sciences*

Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

### PL P 416: Forest Insects and Diseases

(Cross-listed with FOR). (2-2) Cr. 3. F.

*Prereq: BIOL 211; 4 additional credits in life sciences*

Nature of insects and pathogens of forest and shade trees; their role in the dynamics of natural and managed forest ecosystems; and the management of indigenous and exotic pests. Laboratory experience working with insect and fungal pests of trees.

### PL P 452: Integrated Management of Diseases and Insect Pests of Turfgrasses

(Dual-listed with PL P 552). (Cross-listed with ENT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

### PL P 477: Bacterial-Plant Interactions

(Dual-listed with PL P 577). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

### PL P 490: Independent Study

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 7 credits in BIOL; Junior or Senior classification; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

### PL P 490A: Independent Study: Plant Pathology

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; 7 credits in BIOL; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

### PL P 490H: Independent Study: Honors

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Junior or Senior classification; 7 credits in BIOL; Permission of Instructor*

A maximum of 6 credits of PL P 490 may be used toward the total of 128 credits required for graduation.

**PL P 494: Seed Pathology**

(Dual-listed with PL P 594). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PI P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PI P 494/594 and STB/PI P 592.

**PL P 494L: Seed Pathology Laboratory**

(Dual-listed with PL P 594L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PL P 506: Plant-Pathogen Interactions**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416, BIOL 313*

Introduction to mechanisms of plant-parasite interaction. Genetics and molecular genetics of plant disease resistance and pathogenicity.

**PL P 508: Principles of Plant Pathology**

(Dual-listed with PL P 408). (2-2) Cr. 3. F.S.

*Prereq: (BIOL 211 or BIOL 212); 4 additional credits in life sciences*

Principles underlying the nature, diagnosis, and management of plant diseases. Laboratory complements lecture topics and provides experience in plant disease diagnosis.

**PL P 509: Plant Virology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: BIOL 313 or BBMB 301. BIOL 314 recommended.*

Taxonomy, molecular mechanisms, host-interactions, vector transmission, epidemiology, detection, control and exploitation of plant viruses. Course will consist of a mixture of lectures, and student-led presentations using primary literature.

**PL P 511: Integrated Management of Tropical Crops**

(Cross-listed with ENT, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416 or ENT 370 or ENT 376 or HORT 221*

Applications of Integrated Crop Management principles (including plant pathology, entomology, and horticulture) to tropical cropping systems. Familiarization with a variety of tropical agroecosystems and Costa Rican culture is followed by 10-day tour of Costa Rican agriculture during spring break, then writeup of individual projects. Meets International Perspectives Requirement.

**PL P 512: Lifestyles of plant pathogenic fungi and oomycetes.**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: PI P 408 or MICRO 456 or equivalent.*

Exploration of the major groups of plant pathogenic fungi and oomycetes, focusing on the diseases they cause as well as pathogen ecology, diagnosis, crop resistance, and fungicide resistance.

**PL P 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, ENT, SUSAG). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**PL P 543: Ecology and Epidemiology of Plant Diseases**

(2-2) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: PL P 408 or PL P 416*

Nutter. Theory and practice related to the ecology and epidemiology of plant disease epidemics. Interactions among host and pathogen populations as affected by the environment are quantified with respect to time and space. Analysis of ecological and host and pathogen genetic factors that alter the course of plant disease epidemics. Risk assessment theory, disease forecasting, and modeling the impact of biotic plant stresses on yield and quality are also emphasized.

**PL P 552: Integrated Management of Diseases and Insect Pests of Turfgrasses**

(Dual-listed with PL P 452). (Cross-listed with ENT). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: HORT 351*

Identification and biology of important diseases and insect pests of turfgrasses. Development of integrated pest management programs in various turfgrass environments.

**PL P 574: Plant Nematology**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent*

Morphology, anatomy, identification, management, and life cycles of common plant-parasitic nematodes; host parasite interactions; recent advances in plant nematology.

**PL P 574L: Laboratory Techniques in Plant Nematology**

(0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: 8 credits in biological sciences, including BIOL 211 or equivalent.*

*Must also be registered for PI P 574.*

Practical skills of sample collection, processing, extraction, and identification of plant-parasitic nematodes from soil and roots; other techniques will be discussed.

**PL P 577: Bacterial-Plant Interactions**

(Dual-listed with PL P 477). (Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 3 credits in MICRO or PL P*

Overview of plant-associated bacteria including their ecology, diversity, and the physiological and molecular mechanisms involved with their interactions with plants. The course covers bacterial plant pathogens and pathogenesis, nitrogen fixation and plant symbioses, biological control and plant growth promotion, bacterial disease diagnosis and management, and approaches to the study of microbial communities in the rhizosphere and on leaves.

**PL P 581: Experience in Plant Science Extension and Outreach**

(Cross-listed with AGRON, ENT, HORT). Cr. 1. Alt. SS., offered odd-numbered years.

A supervised learning experience in several extension delivery methods used in the plant sciences. Participation in Iowa State University-based extension programs that may include field crop, horticulture, or Master Gardener programming.

**PL P 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 10 credits in biological sciences, permission of instructor*

**PL P 592: Seed Health Management**

(Cross-listed with STB). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Occurrence and management of diseases during seed production, harvest, conditioning, storage, and planting. Emphasis on epidemiology, disease management in the field, seed treatment, effects of conditioning on seed health, and seed health testing. Credit may not be obtained for both PI P/STB 592 and PI P 594.

**PL P 594: Seed Pathology**

(Dual-listed with PL P 494). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Significance of biotic and abiotic diseases that affect the production and utilization of seeds, during each phase of the seed life cycle: growing, harvesting, conditioning, storing, and planting seed. Mechanisms of seed infection and seed-to-seedling transmission are considered for fungi, bacteria, viruses/viroids, and nematodes. Aspects of epidemiology, management, and host-pathogen relationships are discussed. Emphases include the role of seed health testing in the global seed industry for quality control and phytosanitary certification, as well as the use of seed treatments to manage seedborne and soilborne pathogens and pests. Concurrent enrollment in PI P 494L/594L (Seed Pathology Laboratory) is strongly encouraged (on-campus students only). Credit may not be obtained for both PI P 494/594 and STB/PI P 592.

**PL P 594L: Seed Pathology Laboratory**

(Dual-listed with PL P 494L). (0-3) Cr. 1. Alt. F., offered odd-numbered years.

*Prereq: PL P 408*

Laboratory in seed pathology. Seed health testing methods; effects of seed treatments and seed conditioning on seedborne pathogens.

**PL P 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: For non-thesis Master of Science students.*

Independent study related to the student's area of specialization and approved by the student's major professor.

**Courses for graduate students:****PL P 608: Molecular Virology**

(Cross-listed with MICRO, V MPM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**PL P 628: Improving Professional Presentation Skills**

(2-0) Cr. 2. S.

*Prereq: Graduate student status.*

Skill building to improve oral presentation fundamentals for graduate students in biological sciences. Principles and guidance in both personal speaking style and maximizing impact of presentation software. In-depth lectures and class discussions on all aspects of presentation skills. Video and anonymous peer review of individual speeches.

**PL P 691: Field Plant Pathology**

(0-6) Cr. 2. Repeatable. Alt. SS., offered even-numbered years.

*Prereq: PL P 408 or PL P 416*

Diagnosis of plant diseases, plant disease assessment methods, and the integration of disease management into commercial crop production practices. Objectives are to familiarize students with common diseases of Midwest crops and landscape plants, and to provide experience in disease diagnosis. Field trips include commercial operations, agricultural research facilities, and ornamental plantings.

**PL P 692: Molecular Biology of Plant-Pathogen Interactions**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PL P 506 or BBMB 405 or GEN 411 or MICRO 402 or strong background in molecular biology*

Seminal and current research in molecular and physiological aspects of plant interactions with pathogens, including mechanisms of pathogenesis, host-pathogen recognition and host defense, with an emphasis on critical evaluation of primary literature. Students also complete a research proposal writing and peer review exercise.

**PL P 694: Colloquium in Plant Pathology**

(2-0) Cr. 2. Repeatable. S.

*Prereq: PL P 408 or PL P 416, permission of instructor*

Advanced topics in plant pathology, including biological control, cultural control, resistance gene deployment, genetic engineering for disease resistance, chemical control, integrated pest management, emerging diseases, fungal genetics, insect vector biology, professional communications, etc.

**PL P 698: Seminar**

Cr. 1. Repeatable. F.S.

**PL P 699: Thesis and Dissertation Research**

Cr. arr. Repeatable.

F.S.SS.

## Political Science (POL S)

*Any experimental courses offered by POL S can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****POL S 101: Exploring Political Science**

(1-0) Cr. 1. F.S.

Introduction to a variety of approaches to political questions. Relevance to career paths. For political science majors and others interested in exploring political questions. Recommended first semester of freshman year, or as soon as possible after declaring the major. Offered on a satisfactory-fail basis only.

**POL S 111: Introduction to American Government**

(3-0) Cr. 3. F.S.

Fundamentals of American democracy; constitutionalism; federalism; rights and duties of citizens; executive, legislative, and judicial branches of government; elections, public opinion, interest groups, and political parties.

**POL S 121: Introduction to International Politics**

(3-0) Cr. 3. F.S.

Dynamics of interstate relations pertaining to nationalism, the nation state; peace and war; foreign policy making; the national interest; military capability and strategy; case studies of transnational issues, such as population, food, energy, and terrorism.

Meets International Perspectives Requirement.

**POL S 125: Democracy and Dictatorship: Introduction to Comparative Politics**

(3-0) Cr. 3. F.S.

Interactions between governments and citizens in countries outside the US. Causes of democracy, dictatorship, and economic and social development.

Meets International Perspectives Requirement.

**POL S 235: Introduction to Ethics and Politics**

(3-0) Cr. 3. F.

Moral controversies surrounding political issues such as violence, deception, corruption, civil disobedience, democracy, justice, equality, and freedom. Political applications of classic and contemporary texts.

**POL S 261: Thinking Like a Political Scientist: Qualitative Approaches**

(3-0) Cr. 3. F.

Theory and method in empirical political science, with an emphasis on qualitative social-science methodologies. Research design, causal logic, and use of evidence. Content analysis, case studies, focus groups, and interviews.

**POL S 262: Thinking Like a Political Scientist: Quantitative Approaches**

(3-0) Cr. 3. S.

Theory and method in empirical political science, with an emphasis on quantitative social-science methodologies. Research design, causal logic, and use of evidence. Regressions, experiments, and polls and surveys.

**POL S 271: Public Organizations and Leadership**

(3-0) Cr. 3. F.

Introductory survey of public governance at the administrative and managerial levels of international, national, state, and local government. Essential issues and competencies involved in efficient, effective, and ethical provision of public goods and services. Relationships inside and across governments, social equity, public-private partnerships, and privatization.

**POL S 283: Introduction to Environmental Politics and Policies**

(Cross-listed with ENV S). (3-0) Cr. 3. S.

Introduction to how major ideologies address conservation and ecology. Processes, participants, and institutions involved in state, national, and global environmental policymaking. Case studies of environmental controversies and proposals for policy reform.

**POL S 298: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Sophomore classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**POL S 305: Comparative Political Behavior**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Political attitudes and behaviors of citizens in democracies, both in the US and cross-nationally. Citizens' traits and their relationship to democracy.

**POL S 306: Public Opinion and Voting Behavior**

(3-0) Cr. 3.

The formation of political opinions and attitudes, political participation, and voting behavior of the general public, and their influences on American politics; polling as a means of assessing public opinions and behaviors.

**POL S 310: State and Local Government**

(3-0) Cr. 3. F.S.

Role of state and local governments in the American federal system. Structures of participation: political parties, elections, interest groups. Major governmental institutions: legislative, executive, and judicial. Structure and functions of local governments.

**POL S 318: Campaigns and Elections**

(3-0) Cr. 3.

Methods and strategies of political campaigns in American elections. History of the electoral process and the transformation of American campaigns.

**POL S 319: Law and Politics**

(3-0) Cr. 3. F.

American judicial system and controversies spanning law and politics. Potential topics include statutory construction, judicial review, proper role of the judiciary, vagueness and ambiguity in law, competing constitutional philosophies, executive branch concerns, and relative power of different branches. POL S 111 recommended. Only one of POL S 230, 319 may count toward graduation

**POL S 320: American Judicial Process**

(Cross-listed with C J). (3-0) Cr. 3. S.

An overview of the American judicial process. Emphasis on specific topics such as application of constitutional rights to the states (particularly the Fourth, Fifth, Sixth, and Fourteenth Amendments), mechanics of judicial opinions, constitutional philosophies of Supreme Court Justices, decisions of first impression, and the value and scope of precedent.

**POL S 325: Religion, Law, and Justice**

(Cross-listed with C J, RELIG). (3-0) Cr. 3. F.

A study of the role of religion in law and justice with a focus on the United States. Examines the history of religious freedom, key contemporary legal cases, and how religious-oriented justice movements engage ethics and the law.

**POL S 333: Democracy and Diversity in America**

(3-0) Cr. 3. F.

Competing American conceptions of democracy as strategies for responding to the racial, religious, ethnic, gender, and economic diversity of America. Contemporary debates about topics such as immigration, affirmative action, multicultural education, religion, and minority representation.

Meets U.S. Diversity Requirement

**POL S 334: Politics and Society**

(Cross-listed with SOC). (3-0) Cr. 3. F.

*Prereq: A course in political science or sociology*

The relationship between politics and society with emphasis on American society. Discussion of theories of inequality, power, social movements, elites, ruling classes, democracy, and capitalism.

**POL S 335: Science, Technology, and Public Policy**

(3-0) Cr. 3. S.

Examines the history and political dynamics of public science and technology policies. Examines differences in political and technological orientations. Assessment of the roles of politics, media, engineering, science, and private business in the formation of public policies that put heavy reliance on or seek to advance science and technology.

**POL S 339: Liberty and Law in America**

(Cross-listed with C J, PHIL). (3-0) Cr. 3. F.S.

Competing conceptions of liberty in American political thought. Debates about how liberty should be protected by the law, in fields such as health care, drugs, property, speech, religion, and sex.



**POL S 340: Politics of Developing Areas**

(3-0) Cr. 3.

Economic and political development as they relate to the political process of developing states. Impact of social and technological change on political systems of developing areas.

Meets International Perspectives Requirement.

**POL S 342: Chinese Politics**

(3-0) Cr. 3.

Legacies of Imperial China, the origins of the Chinese Civil War, and the causes and consequences of the reform era. Issues of contemporary China, including economic transformation, the structure of the Party/state, the environment, the media and other topics.

Meets International Perspectives Requirement.

**POL S 343: Latin American Government and Politics**

(Cross-listed with US LS). (3-0) Cr. 3.

Political institutions, processes, and contemporary issues. Selected countries examined intensively to illustrate generalizations. Role of parties, military, church, human rights, women, environmental issues, interest groups, ideology, and globalization.

Meets International Perspectives Requirement.

**POL S 344: Public Policy**

(3-0) Cr. 3. F.S.

How agendas come to be set in public policy, theories describing the policy-making process, forces molding policy choices and the impact of such choices.

**POL S 346: European Politics**

(3-0) Cr. 3.

Comparative study of political institutions of Europe and the European Union; emphasis on parties, elections, and governmental structures. Substance and process of public policies in selected problem areas.

Meets International Perspectives Requirement.

**POL S 348: British Government and Politics**

(3-0) Cr. 3.

Political institutions and processes in Great Britain and Northern Ireland; emphasis on Parliament, executive and monarchy, and public policies, including devolution.

Meets International Perspectives Requirement.

**POL S 349: Politics of Russia and Eastern Europe**

(3-0) Cr. 3.

Nation-states of Central and Eastern Europe. Comparison of European communist systems and the revolutionary conflict leading to the dissolution of communist Europe. Political analysis of post-communist Russian and Eastern European nation-states and their economic, cultural and social variations.

Meets International Perspectives Requirement.

**POL S 350: Politics of the Middle East**

(3-0) Cr. 3. S.

Introduction to the Middle East as a region and to issues of political importance to the Middle East and its place in the world. Topics covered include political Islam, regional conflicts and alliances, local leaders, political economy, democracy, and human rights.

Meets International Perspectives Requirement.

**POL S 353: Immigration Policy**

(3-0) Cr. 3. F.

Political, economic, and social factors that affect immigration policy. Systematic analysis and implications of different types of immigration policies in countries sending and receiving immigrants. Policies regarding incorporation of migrants into, and effects of migrants on, American society.

**POL S 354: War and the Politics of Humanitarianism**

(Cross-listed with ANTHR). (3-0) Cr. 3.

Humanitarianism as a system of thought and a system of intervention in conflict and post-conflict situations. Role of humanitarian organizations and actors in addressing human suffering caused by conflict or war.

Military action as a form of humanitarian intervention.

Meets International Perspectives Requirement.

**POL S 355: War and Politics**

(3-0) Cr. 3. F.

Theoretical relationship among politics, strategy, and war. Evolution of war, the relationship between technology and conflict, and the changing causes and nature of global violence.

Meets International Perspectives Requirement.

**POL S 356: Theories of International Politics**

(3-0) Cr. 3.

Introduction to essential theoretical concepts and approaches, both classical and contemporary on world politics including realism, empiricism, liberalism, and postpositivism; for example, war and conflict, peace and cooperation, political economy, crisis decision-making, systemic theory, dependence and interdependence.

**POL S 357: International Security Policy**

(3-0) Cr. 3.

Contemporary approaches in the security area including strategic deterrence, cybersecurity, environmental security, peacekeeping and terrorism. Current cases to illustrate policies as well as historical and theoretical choices.

**POL S 358: United States Foreign Policy**

(3-0) Cr. 3.

U.S. foreign policy since World War II with emphasis on changing American values in foreign policy, the role of the President, Congress, and the bureaucracy in policy making, and a survey of current foreign policy issues and problems.

**POL S 359: Current Issues in American Foreign Policy**

(3-0) Cr. 3.

Examination of contemporary U.S. foreign policy issues (e.g., U.S. policy in the Middle East; defense budgeting in the post-Cold War era; conventional and nuclear arms control policy). The course will explore alternate methods to analyze policy, survey the evolution of each issue, and discuss different policy alternatives.

**POL S 360: American Institutions: Congress**

(3-0) Cr. 3.

Theory and practice of representation and deliberation in the legislative branch of the republic; operations of Congress in terms of its committees, leadership, legislative and oversight processes, partisan politics, electoral campaigns, service to local and special electoral campaigns, service to local and special interests, and interactions with the President.

**POL S 361: American Institutions: The Presidency**

(3-0) Cr. 3.

Creation and historical development of the office of chief executive; character and behavior of past chief executives; selection and control; powers, roles, functions; executive staff; relations with Congress, press, public opinion.

**POL S 363: American Institutions: Media**

(3-0) Cr. 3. S.

Influence of mass media organizations, forms, techniques, and technologies on the practices and expectations of American politics. Role of media in the political process, including promoting or discouraging political participation. Politics of traditional journalism, devices of propaganda, effects of campaign advertising, and media spectacles.

**POL S 364: Political Parties and Interest Groups**

(3-0) Cr. 3.

Nature of political parties and interest groups, their relation to each other, and their effects on American politics. Topics include party identification, party organization and mobilization, factionalism, lobbying, campaign contributions and financing, and the effects of special interests on public law.

**POL S 370: Religion and Politics**

(Cross-listed with RELIG). (3-0) Cr. 3. F.

The interaction of religion and politics in the U.S. from both an historical and contemporary perspective, as well as the role of religion in politics internationally.

**POL S 381: International Political Economy**

(3-0) Cr. 3.

Politics of international economic interaction. Trade wars and agreements, cross-border finance and multinational corporations, exchange rates and monetary policy, outsourcing, and development under conditions of globalization.

**POL S 385: Women in Politics**

(Cross-listed with WGS). (3-0) Cr. 3. S.

Entry and participation of women in politics in the United States and other countries. Contemporary issues and strategies for change through the political process.

Meets U.S. Diversity Requirement

**POL S 387: First Ladies in U.S. History**

(Cross-listed with HIST, WGS). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

Evolution of the role and office of the First Lady in U.S. history, including her political activism, social impact, and international influence. Analysis of the authority, intersectionality, and agency of First Ladies in the aggregate and exploration of how individual First Ladies have interpreted and adapted this unique public position.

**POL S 390: Topics in Political Science**

Cr. 1-4. Repeatable.

Selected topics in political science. A topic may not be taken more than once.

**POL S 397: International Study and Travel**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Supervised study in an aspect of discipline while traveling or located in a foreign country.

Meets International Perspectives Requirement.

**POL S 398: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Junior classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing work period.

**POL S 401: Political Analysis and Research**

(Dual-listed with POL S 501). (3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Scope and methods of political science. Introduction to theoretical approaches and analytical reasoning in political science. Relationship of theory and data. Research design.

**POL S 407: Proseminar in Public Policy**

(Dual-listed with POL S 507). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

An overview of the major theoretical approaches and empirical methods relevant to the study of public policy. Emphasis is placed on agenda setting, policy formation, policy sustainability, and policy analysis. Seminal writings by leading scholars will be reviewed. Leading quantitative and qualitative methodological tools for analyzing policy are presented.

**POL S 408: Policy Implementation**

(Dual-listed with POL S 508). Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Sophomore classification*

The implementation phase of the policy process, primarily within the government sector, with respect to specific programs, rules, or pieces of legislation within a larger policy area, e.g., health, environment, transportation, education, foreign policy.

**POL S 409: Political Game Theory**

(Dual-listed with POL S 509). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Application of economics to political science in the study of nonmarket decision-making. Behavior of bureaucrats, elected officials, and voters. Market failure, collective action, representative democracies, direct democracies, logrolling, voter paradoxes, and game theory.

**POL S 417: Campaign Rhetoric**

(Cross-listed with SP CM). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: SP CM 212*

Backgrounds of candidates for state and national elections; selected speeches and issues; persuasive strategies and techniques of individual speakers.

**POL S 419: The Judiciary**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Judicial review, federal common law, judicial confirmation, strict construction of the Constitution, and qualifications to serving on Courts; judicial activism and the infusion of politics into courts.

**POL S 420: Constitutional Law**

(3-0) Cr. 3. F.

*Prereq: Junior classification*

Development of the United States Constitution through judicial action; influence of public law and judicial interpretations upon American government and society.

**POL S 421: Constitutional Freedoms**

(3-0) Cr. 3. S.

*Prereq: Junior classification*

Leading Supreme Court cases interpreting the Bill of Rights and the Fourteenth Amendment. Emphasis on religion, speech, privacy, due process, and equal protection.

**POL S 422: International Law**

(Dual-listed with POL S 522). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Legal aspects of international activities: state jurisdiction over territories and subjects, law of the sea, use of force, and judicial settlement of international disputes.

**POL S 430: Foundations of Western Political Thought**

(Dual-listed with POL S 530). (Cross-listed with CL ST). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the classical period to the renaissance. Topics such as justice, freedom, virtue, the allocation of political power, the meaning of democracy, human nature, and natural law.

**POL S 431: Modern Political Thought**

(Dual-listed with POL S 531). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the Reformation to the French Revolution and its aftermath. Topics such as justice, freedom, rights, democracy, toleration, property, power, skepticism, and normative views of international politics.

**POL S 435: Contemporary Political Philosophy**

(Dual-listed with POL S 535). (Cross-listed with PHIL). (3-0) Cr. 3. S.

*Prereq:* 6 credits in PHIL or POL S, or Permission of Instructor

Examination of theories of justice proposed by contemporary political philosophers. Analysis of the philosophical foundations of perspectives such as egalitarianism, libertarianism, and socialism. Normative assessment of social and political institutions.

**POL S 443: Energy Policy**

(Dual-listed with POL S 543). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Energy policies and related social, environmental, and political issues. Energy problems and the impact of energy policies.

**POL S 452: Comparative Foreign Policy**

(Dual-listed with POL S 552). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Theoretical approaches to understanding foreign policy making and behavior through case studies of selected nations.

Meets International Perspectives Requirement.

**POL S 453: International Organization**

(Dual-listed with POL S 553). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Sources of international order in a variety of substantive areas such as international security, international trade and finance, the environment, and human rights: distribution of power, institutions, international law, and norms.

**POL S 460: American Political Institutions**

(Dual-listed with POL S 560). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq:* Sophomore classification

Examination of policy-making and governance in a separation of powers system. Interaction between the chief executive, the legislature, administrative agencies, and the public. How political and legal forces affect policy makers and are reflected in public policies and programs.

**POL S 474: Policy and Program Evaluation**

(Dual-listed with POL S 574). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Integration, application, and utilization of public administration and public policy concepts in the interpretation of results and effectiveness of public programs and the prediction of consequences for policymakers and administrators.

**POL S 475: Management in the Public Sector**

(Dual-listed with POL S 575). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Literature and research on organizational behavior and management theory with emphasis on applied aspects of managing contemporary public-sector organizations. Distinctions between public and private organizations, leadership, productivity, employee motivation, organizational structure, and organizational change.

**POL S 477: Government, Business, and Society**

(Dual-listed with POL S 577). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Diverse perspectives on the changing roles and relationships of business, government, and society for more effective policy decisions on corporate affairs. The changing economy; transformation of workplace and community conditions; consumerism; social responsibilities of businesses; economic policies and regulations; politics in the business-government relationship.

**POL S 480: Ethics and Public Policy**

(Dual-listed with POL S 580). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Study of decision making approaches and application to case studies. Topics such as the different roles of public officials, proper scope and use of administrative discretion, and the admissibility of religious, political, and philosophical commitments in governmental decision making.

**POL S 487: Electronic Democracy**

(Dual-listed with POL S 587). (3-0) Cr. 3.

*Prereq:* Sophomore classification

Impact of computers and the Internet on politics and policy. Positive and negative effects of information technology (IT) on selected topics such as hacking, cybercrime, cyberterrorism, cyberwarfare, privacy, civic participation, the sense of community, virtual cities, interest group behavior, viral media, campaigns, elections, and voting.

**POL S 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq:* 6 credits in POL S; Permission of Instructor

Special studies in the political institutions, processes and policies of American, foreign, and international governments. Also, studies in traditional and behavioral political theory. Use of credit in Pol S major and minor is limited. See Undergraduate Study for information. No more than 9 credits of Pol S 490 may be counted toward graduation.

**POL S 490H: Independent Study: Honors**

Cr. arr. Repeatable, maximum of 9 credits. F.S.

*Prereq: 6 credits in POL S; Permission of Instructor*

Special studies in the political institutions, processes and policies of American, foreign, and international governments. Also, studies in traditional and behavioral political theory. Use of credit in Pol S major and minor is limited. See Undergraduate Study for information. No more than 9 credits of Pol S 490 may be counted toward graduation.

**POL S 491: Senior Thesis**

Cr. 3.

*Prereq: 21 credits of POL S; Permission of Instructor*

Written under the supervision of a Political Science faculty advisor.

**POL S 492: Graduating Senior Survey**

Cr. R. F.S.SS.

*Prereq: Graduating senior*

Outcomes-assessment activities including job-placement surveys and evaluations of instructors, advisors, and courses. Offered on a satisfactory-fail basis only. Offered on a satisfactory-fail basis only.

**POL S 496: Teaching Internship in Political Science**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: 12 credits in POL S; Permission of Instructor*

Undergraduate teaching experience through assisting an instructor with an introductory course in political science. Use of credit in Pol S major and minor is limited. See Undergraduate Study for information. Offered on a satisfactory-fail basis only.

**POL S 497: Research Internship in Political Science**

(3-0) Cr. 3. Repeatable, maximum of 6 credits. F.S.

*Prereq: 12 credits in POL S; Permission of Instructor*

Undergraduate research experience through assisting on a scholarly project with an instructor in political science. Use of credit in Pol S major and minor is limited. See Undergraduate Study for information. Offered on a satisfactory-fail basis only.

**POL S 498: Cooperative Education**

Cr. R. Repeatable. F.S.SS.

*Prereq: Senior classification; Department Cooperative Education Coordinator Permission*

Required of all cooperative education students. Students must register for this course prior to commencing each work period.

**POL S 499: Internship in Political Science**

Cr. arr. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: 6 credits in POL S; Junior or Senior classification; Internship Coordinator Permission*

Work experience with a specific nongovernmental or governmental agency at the local, state, national, or international level, combined with academic work under faculty supervision. Use of credit in Pol S major and minor is limited. See Undergraduate Study for information. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**POL S 501: Political Analysis and Research**

(Dual-listed with POL S 401). (3-0) Cr. 3. F.

*Prereq: Sophomore classification*

Scope and methods of political science. Introduction to theoretical approaches and analytical reasoning in political science. Relationship of theory and data. Research design.

**POL S 504: Proseminar in International Politics**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: 6 credits in political science or graduate standing*

Overview of major theoretical and empirical works in the study of international politics and foreign policy. Realism, liberalism, and constructivism; conflict, alliances, and international economic relations.

**POL S 505: Proseminar in Comparative Politics**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 6 credits in political science or graduate standing*

Foundations of comparative politics, the study of different political regimes. Political behavior, development, causes and consequences of democracy and authoritarianism. Contrasting research methods and designs.

**POL S 506: Proseminar in American Politics**

(3-0) Cr. 3.

*Prereq: 6 credits in political science or graduate standing*

Major theories and research on American government and politics.

Modern democratic theory, institutional performance, and mass political behavior. Research methodologies including normative theory, behavioralism, and rational choice analysis.

**POL S 507: Proseminar in Public Policy**

(Dual-listed with POL S 407). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

An overview of the major theoretical approaches and empirical methods relevant to the study of public policy. Emphasis is placed on agenda setting, policy formation, policy sustainability, and policy analysis. Seminal writings by leading scholars will be reviewed. Leading quantitative and qualitative methodological tools for analyzing policy are presented.

**POL S 508: Policy Implementation**

(Dual-listed with POL S 408). Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Sophomore classification*

The implementation phase of the policy process, primarily within the government sector, with respect to specific programs, rules, or pieces of legislation within a larger policy area, e.g., health, environment, transportation, education, foreign policy.

**POL S 509: Political Game Theory**

(Dual-listed with POL S 409). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Application of economics to political science in the study of nonmarket decision-making. Behavior of bureaucrats, elected officials, and voters. Market failure, collective action, representative democracies, direct democracies, logrolling, voter paradoxes, and game theory.

**POL S 510: State Government and Politics**

(3-0) Cr. 3.

*Prereq: POL S 310*

Comparative analysis of state political systems. Role of interest groups, political parties, legislatures, courts, and governors in state politics. Possible determinants of public policy outputs at the state level.

**POL S 522: International Law**

(Dual-listed with POL S 422). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Legal aspects of international activities: state jurisdiction over territories and subjects, law of the sea, use of force, and judicial settlement of international disputes.

**POL S 525: Mass Political Behavior**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 6 credits in Political Science or graduate standing*

An in-depth survey of the theoretical, empirical, and methodological works concerning mass political behavior in the United States. Substantive topics include political attitudes and ideologies, public opinion and voting behavior, and political psychology. Methods for studying mass behavior include survey research and experimental approaches.

**POL S 530: Foundations of Western Political Thought**

(Dual-listed with POL S 430). (Cross-listed with CL ST). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the classical period to the renaissance. Topics such as justice, freedom, virtue, the allocation of political power, the meaning of democracy, human nature, and natural law.

**POL S 531: Modern Political Thought**

(Dual-listed with POL S 431). (3-0) Cr. 3.

*Prereq: 6 credits in POL S, HIST, or PHIL*

Study of original texts in political thought ranging from the Reformation to the French Revolution and its aftermath. Topics such as justice, freedom, rights, democracy, toleration, property, power, skepticism, and normative views of international politics.

**POL S 534: Legal and Ethical Issues in Cyber Security**

(Cross-listed with CPR E, CYBSC). (3-0) Cr. 3. S.

*Prereq: Graduate classification; CPR E 531 or CYBSC 531*

Legal and ethical issues in computer security. State and local codes and regulations. Privacy issues.

**POL S 535: Contemporary Political Philosophy**

(Dual-listed with POL S 435). (Cross-listed with PHIL). (3-0) Cr. 3. S.

*Prereq: 6 credits in PHIL or POL S, or Permission of Instructor*

Examination of theories of justice proposed by contemporary political philosophers. Analysis of the philosophical foundations of perspectives such as egalitarianism, libertarianism, and socialism. Normative assessment of social and political institutions.

**POL S 543: Energy Policy**

(Dual-listed with POL S 443). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Energy policies and related social, environmental, and political issues. Energy problems and the impact of energy policies.

**POL S 552: Comparative Foreign Policy**

(Dual-listed with POL S 452). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Theoretical approaches to understanding foreign policy making and behavior through case studies of selected nations. Meets International Perspectives Requirement.

**POL S 553: International Organization**

(Dual-listed with POL S 453). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Sources of international order in a variety of substantive areas such as international security, international trade and finance, the environment, and human rights: distribution of power, institutions, international law, and norms.



**POL S 560: American Political Institutions**

(Dual-listed with POL S 460). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Sophomore classification*

Examination of policy-making and governance in a separation of powers system. Interaction between the chief executive, the legislature, administrative agencies, and the public. How political and legal forces affect policy makers and are reflected in public policies and programs.

**POL S 571: Organizational Theory in the Public Sector**

(3-0) Cr. 3.

*Prereq: Graduate classification*

Major theories of administrative organization, including motivations of administrators and organizations, comparisons of organizational arrangements, factors affecting organizational arrangements, and formal and informal decision-making structures.

**POL S 574: Policy and Program Evaluation**

(Dual-listed with POL S 474). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Integration, application, and utilization of public administration and public policy concepts in the interpretation of results and effectiveness of public programs and the prediction of consequences for policymakers and administrators.

**POL S 575: Management in the Public Sector**

(Dual-listed with POL S 475). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Literature and research on organizational behavior and management theory with emphasis on applied aspects of managing contemporary public-sector organizations. Distinctions between public and private organizations, leadership, productivity, employee motivation, organizational structure, and organizational change.

**POL S 577: Government, Business, and Society**

(Dual-listed with POL S 477). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Diverse perspectives on the changing roles and relationships of business, government, and society for more effective policy decisions on corporate affairs. The changing economy; transformation of workplace and community conditions; consumerism; social responsibilities of businesses; economic policies and regulations; politics in the business-government relationship.

**POL S 580: Ethics and Public Policy**

(Dual-listed with POL S 480). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Study of decision making approaches and application to case studies. Topics such as the different roles of public officials, proper scope and use of administrative discretion, and the admissibility of religious, political, and philosophical commitments in governmental decision making.

**POL S 587: Electronic Democracy**

(Dual-listed with POL S 487). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Impact of computers and the Internet on politics and policy. Positive and negative effects of information technology (IT) on selected topics such as hacking, cybercrime, cyberterrorism, cyberwarfare, privacy, civic participation, the sense of community, virtual cities, interest group behavior, viral media, campaigns, elections, and voting.

**POL S 590: Special Topics**

Cr. 2-5. Repeatable. F.S.

*Prereq: 15 credits in political science, written permission of instructor*

**POL S 590A: Special Topics: American Politics**

Cr. 2-5. Repeatable. F.S.

*Prereq: 15 credits in political science, written permission of instructor*

**POL S 590D: Special Topics: Global Politics**

Cr. 2-5. Repeatable. F.S.

*Prereq: 15 credits in political science, written permission of instructor*

**POL S 590G: Special Topics: Public Policy**

Cr. 2-5. Repeatable. F.S.

*Prereq: 15 credits in political science, written permission of instructor*

**POL S 590J: Special Topics: Theory, Law, and Methods**

Cr. 2-5. Repeatable. F.S.

*Prereq: 15 credits in political science, written permission of instructor*

**POL S 598: Graduate Student Internship**

Cr. 3-6. Repeatable, maximum of 6 credits. F.S.

*Prereq: 15 credits in political science, permission of the instructor*  
Supervised internship with administrative agencies, legislative organizations, judicial branch offices, and nonprofit groups.

**POL S 599: Creative Component**

Cr. arr.

**Courses for graduate students:**

**POL S 610: Graduate Seminars**

(3-0) Cr. 3. Repeatable.

*Prereq: 15 credits in political science*

**POL S 610A: Graduate Seminars: American Politics**

(3-0) Cr. 3. Repeatable.

*Prereq: 15 credits in political science***POL S 610D: Graduate Seminars: Global Politics**

(3-0) Cr. 3. Repeatable.

*Prereq: 15 credits in political science***POL S 610G: Graduate Seminars: Public Policy**

(3-0) Cr. 3. Repeatable.

*Prereq: 15 credits in political science***POL S 699: Thesis**

Cr. arr. Repeatable.

## Portuguese (PORT)

***Any experimental courses offered by PORT can be found at:***[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)**Courses primarily for undergraduates:****PORT 101: Elementary Portuguese I**

Cr. 4.

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture.

**PORT 102: Elementary Portuguese II**

Cr. 4.

*Prereq: PORT 101*

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture.

Meets International Perspectives Requirement.

**PORT 111: Intensive Beginning Portuguese**

Cr. 3.

A communicative approach to grammar and vocabulary within the context of Luso-Brazilian culture for students whose native language is not Portuguese. Taught in Portuguese.

**PORT 112: Elementary Portuguese, Accelerated II**

Cr. 3.

*Prereq: PORT 111*

An introduction to the Portuguese language through the communicative approach within the context of Luso-Brazilian culture.

Meets International Perspectives Requirement.

**PORT 375: Brazil Today**

Cr. 3. F.

A survey of social, political, economic, and cultural topics relevant to contemporary Brazil. Includes an introduction to Portuguese language. Meets International Perspectives Requirement.

## Psychology (PSYCH)

***Any experimental courses offered by PSYCH can be found at:***[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)**Courses primarily for undergraduates:****PSYCH 101: Introduction to Psychology**

(3-0) Cr. 3. F.S.SS.

Fundamental psychological concepts derived from the application of the scientific method to the study of behavior and mental processes. Applications of psychology.

**PSYCH 102: Laboratory in Introductory Psychology**

(0-2) Cr. 1. F.S.

*Prereq: Credit or concurrent enrollment in PSYCH 101*  
Laboratory to accompany 101.**PSYCH 111: Orientation to Psychology**

Cr. 1. F.S.

Program requirements and degree/career options. Required of psychology majors.

**PSYCH 112: Psychology Learning Community Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

Topics include orientation to academic program requirements, career awareness, strategies for successful transition to college, connections with other disciplines, and applying psychology via service learning opportunities.

**PSYCH 131: Academic Learning Skills**

(1-0) Cr. 1. F.S.

Evidence-based approach to learning and applying academic skills such as time management, note-taking, reading, test preparation, goal setting and motivation, and well-being. Hybrid course structured in a team-based learning format.

**PSYCH 211: Career Opportunities in Psychology**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 111 or PSYCH 112 or Sophomore classification*

Introduction to career options for psychology majors. Development of foundational career preparation topics like resume writing, interviewing, and other career-related topics. Thorough introduction to the sub-fields of psychology. Guidance on applying to graduate school or seeking a job with a bachelor's degree.

**PSYCH 230: Developmental Psychology**

(3-0) Cr. 3. F.S.SS.

Life-span development of physical traits, cognition, intelligence, language, social and emotional behavior, personality, and adjustment.

**PSYCH 250: Psychology of the Workplace**

(3-0) Cr. 3.

Survey of theories and research methods of psychology applied to the workplace. Consideration of employee selection, training, performance evaluation, leadership, work groups, employee motivation, job attitudes and behaviors, organizational culture, organizational development, human factors, and job design from the scientist-practitioner approach.

**PSYCH 280: Social Psychology**

(3-0) Cr. 3. F.S.SS.

Individual human behavior in social contexts. Emphasis on social judgments and decisions, attitudes, perceptions of others, social influence, aggression, stereotypes, and helping.

**PSYCH 291: Introductory Research Experience**

Cr. 1-4. Repeatable, maximum of 4 credits. F.S.

*Prereq: PSYCH 101; Sophomore classification; Permission of Instructor*

Beginning level supervised research experience in a faculty laboratory. Offered on a satisfactory-fail basis only.

**PSYCH 301: Research Design and Methodology**

(3-0) Cr. 3. F.S.SS.

*Prereq: (STAT 101 or STAT 104 or STAT 226); 1 PSYCH course*

Overview of the principal research techniques used in psychology with an emphasis on the statistical analysis of psychological data.

**PSYCH 302: Research Methods in Psychology**

(2-2) Cr. 3. F.S.

*Prereq: PSYCH 301; ENGL 250*

Discussion of and experience in designing research studies, collecting and analyzing data, and preparing research reports in psychology.

**PSYCH 310: Brain and Behavior**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Survey of basic concepts in the neurosciences with emphasis on brain mechanisms mediating sensory processes, arousal, motivation, learning, and abnormal behavior.

**PSYCH 312: Sensation and Perception**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Survey of the physiology and psychology of human sensory systems including vision, audition, smell, taste, the skin senses, and the vestibular senses.

**PSYCH 313: Learning and Memory**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Survey of fundamental concepts and theories related to learning and memory derived from human and animal research.

**PSYCH 314: Motivation**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Theory and research on motivation at biological, environmental, and psychological levels. Topics include emotion, eating, sex, music, addictions, incentives, goal performance, personality, coping, self-determination and purpose.

**PSYCH 315: Drugs and Behavior**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Biologically based examination of the effects of drugs on behavior and social interactions, including recreational drugs and drugs used in the treatment of psychiatric and neurological disorders.

**PSYCH 316: Cognitive Psychology**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101*

Overview of human cognition, including sensation and perception, attention, memory, language, and judgment and decision making.

**PSYCH 318: Judgment and Decision Making**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101; (STAT 101 or STAT 104 or STAT 226 or Permission of Instructor)*

Understanding human reasoning and decision making, including evaluating evidence, judging probabilities, emotional influences, and social dilemmas, with emphasis on the mechanisms that underlie decision making.

**PSYCH 320: Sleep and Dreams**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: PSYCH 101*

Scientific study of sleep and dreams including basic biological and psychological aspects of sleep-wake cycles, the nature and function of dreams, and the role of sleep in human behavior, performance, and well-being. Sleep problems and their social consequences.

**PSYCH 327: Persuasion and Social Influence**

(Cross-listed with COMST). (3-0) Cr. 3. F.S.SS.

Examination of theories and research in persuasive communication, including attitudes and social influence. Emphasis on persuasive communication strategies in everyday social settings that influence changes in attitudes and actions.

**PSYCH 333: Educational Psychology**

(Cross-listed with EDUC). (3-0) Cr. 3. F.S.

*Prereq: PSYCH 230 or HD FS 102, pursuing educator preparation or major in psychology*

Psychological theories relevant to student development, learning, and motivation. Review of assessment principles and practices. Implications of theory for teaching children and for assessing learning in K-12 educational settings, with an emphasis on grades 5 – 12.

**PSYCH 335: Child and Adolescent Psychopathology**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101; (HD FS 102 or PSYCH 230)*

Psychopathology of children and adolescents, including childhood depression and anxiety disorders. Consideration of multiple probable causes and corresponding therapies.

**PSYCH 346: Psychology of Women**

(Cross-listed with WGS). (3-0) Cr. 3. S.

*Prereq: PSYCH 101; 1 additional PSYCH course*

Survey of theory and research related to major biological, interpersonal, and cultural issues affecting girls' and women's psychological development and behavior.

**PSYCH 347: U.S. Latino/a Psychology**

(Cross-listed with US LS). (3-0) Cr. 3. S.

*Prereq: PSYCH 101; 1 additional PSYCH course*

Historical, political, and social contexts of psychological and mental health constructs in terms of their validity and utility for use with Latino/a people in the U.S. Unique aspects of psychological functioning particular to Latino/a people in the U.S.

Meets U.S. Diversity Requirement

**PSYCH 348: Psychology of Religion**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: 9 credits in PSYCH*

Survey of psychological theory and research investigating religious and spiritual attitudes, beliefs and practices.

**PSYCH 350: Human Factors in Technology**

(3-0) Cr. 3. F.

*Prereq: PSYCH 101; Junior classification*

Understanding human behavior and cognition in the context of modern technologies. Focus on emergent interactive technologies, human computer interaction, user centered design, usability analysis, and usability testing.

**PSYCH 360: Personality Psychology**

(3-0) Cr. 3. F.S.SS.

*Prereq: PSYCH 101*

Historical and contemporary theory and research on development and expression of personality with a focus on normal functioning.

**PSYCH 380: Social Cognition**

(3-0) Cr. 3.

*Prereq: PSYCH 101 or PSYCH 280*

How people understand themselves and others, including attitude formation and change, attribution, impression formation, social categories and schemas, the self, stereotypes, and prejudice.

**PSYCH 383: Psychology and Law**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101 or PSYCH 280*

Survey of topics in the interface between psychology and the legal system including but not limited to Miranda warning, confessions, police interrogation, lie detection, juries, eyewitness identification, false memories, and the death penalty.

**PSYCH 386: Media Psychology**

Cr. 3. F.S.SS.

*Prereq: PSYCH 101 or PSYCH 230 or PSYCH 280*

Theories and research on the psychological mechanisms (e.g., attitudes, perceptions, emotions, arousal) by which media influence children and adults. Topics include media violence, educational media, advertising, music, video games, media literacy, and ratings.

**PSYCH 405: History of Psychology**

(Dual-listed with PSYCH 505). (3-0) Cr. 3. S.

*Prereq: 4 courses in PSYCH*

Origins of psychology in philosophy, physiology, medicine and religion. Development as a scientific discipline during the nineteenth and twentieth centuries. Historical overview of clinical practice and theory.

**PSYCH 411: Evolutionary Psychology**

(3-0) Cr. 3. S.

*Prereq: 3 courses in PSYCH; 1 course in BIOL; Junior classification*

Examination of the application of the principles of evolutionary biology to the understanding of human behavior. Evolutionary perspectives on brain development, cognition, language, mating behavior, sex differences, altruism, artistic behavior, and criminal behavior are explored. Arguments by those critical of the evolutionary approach to psychology are also examined.

**PSYCH 413: Psychology of Language**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: PSYCH 101*

Introduction to psycholinguistics. Topics may include origin of language, speech perception, language comprehension, reading, bilingualism, brain bases of language, and computational modeling of language processes.

**PSYCH 422: Counseling Theories and Techniques**

(3-0) Cr. 3. F.

*Prereq: 3 courses in PSYCH*

Overview of the major counseling theories and techniques, with emphasis on the key concepts of each theory, the role of the counselor, therapeutic goals, and the main techniques derived from each theory.

**PSYCH 422L: Laboratory in Counseling Theory and Techniques**

(0-2) Cr. 1. F.

*Prereq: 3 courses in PSYCH; credit or concurrent enrollment in PSYCH 422*

Learn basic counseling skills such as active listening, reflecting feelings, empathy, confrontation, immediacy and self-disclosure. Supervised practice using basic counseling skills.

**PSYCH 440: Psychological Measurement I**

(2-2) Cr. 3. F.S.SS.

*Prereq: PSYCH 301; 9 additional PSYCH credits; (STAT 101 or STAT 104 or STAT 226)*

Principles of psychological measurement, including concepts of reliability and validity; interpretation of scores; factors influencing performance; construction and use of measures of ability, achievement, and personality.

**PSYCH 450: Industrial Psychology**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 101; 1 additional PSYCH course; (STAT 101 or STAT 104 or STAT 226)*

Theory, content and methods of industrial psychology related to the effective operation of organizations. Application of psychology principles to topics including different approaches used to select employees, how to conduct performance appraisals, and how to train and keep employees safe. Work attitudes and behaviors of employees as well as relevant legal issues. Statistics including regression and correlation are used.

**PSYCH 460: General Psychopathology**

(3-0) Cr. 3. F.S.SS.

*Prereq: PSYCH 101; 2 additional PSYCH courses*

Description of major forms of psychopathology including anxiety, mood disorders, personality disorders, substance abuse, and schizophrenia. Coverage of research examining causes, development, and clinical issues concerning psychopathology.

**PSYCH 484: Psychology of Close Relationships**

(3-0) Cr. 3.

*Prereq: PSYCH 280; 6 additional credits in PSYCH*

Theories and research concerning the functions, development, and deterioration of close relationships. Influence of psychological processes on friendship, romantic, marital, and family relationships. Topics include mate selection, interdependence, trust and commitment, power and dominance in relationships, sexuality, divorce, gender roles, and family interaction.

**PSYCH 485: Health Psychology**

(3-0) Cr. 3. F.

*Prereq: 6 credits in PSYCH; Junior classification*

Application of psychological theory and research methods to issues in physical health. Psychological factors in illness prevention, health maintenance, treatment of illness, recovery from injury and illness, and adjustment to chronic illness.

**PSYCH 487: Human Aggression**

(3-0) Cr. 3. S.

*Prereq: (PSYCH 230 or PSYCH 280); PSYCH 301; (PSYCH 313, PSYCH 316, PSYCH 318, PSYCH 360, or PSYCH 380)*

Theory and research on development and occurrence of human aggression; implications for prevention and treatment.

**PSYCH 488: Cultural Psychology**

(3-0) Cr. 3.

*Prereq: PSYCH 280; PSYCH 301; Junior classification*

Examination of the ways that cultural beliefs, values, and affordances shape cognitive, developmental, social and other psychological phenomena, as well as the forces that shape and change culture. Meets International Perspectives Requirement.

**PSYCH 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 6 credits in PSYCH; Junior classification; Permission of Instructor*

Supervised reading in an area of psychology. Writing requirement. No more than 9 credits of Psych 490 may be counted toward a degree in psychology.

**PSYCH 491: Research Practicum**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Credit or concurrent enrollment in PSYCH 301; Junior classification; Permission of Instructor*

Supervised research in an area of psychology. Primarily for students intending to pursue graduate education. No more than 9 credits of Psych 491 may be counted toward a degree in psychology.

**PSYCH 492: Fieldwork Practicum**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 12 credits in PSYCH; Junior classification; Permission of Instructor*

Supervised fieldwork in one of the following applied psychology settings. Offered on a satisfactory-fail basis only. No more than 9 credits of Psych 492 may be counted toward a degree in psychology.

**PSYCH 492A: Fieldwork Practicum: Human Services**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 12 credits in PSYCH; Junior classification; Permission of Instructor*

Offered on a satisfactory-fail basis only.

**PSYCH 492B: Fieldwork Practicum: I/O Psychology**

Cr. arr. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: (PSYCH 250 or PSYCH 450); 9 additional PSYCH credits; Junior classification; Permission of Instructor*

Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**PSYCH 501: Foundations of Behavioral Research**

(3-0) Cr. 3. F.S.

Ethical issues, research design, sampling design, measurement issues, power and precision analysis, interpretation of statistical results in non-experimental, quasi-experimental, and experimental research, use of statistical packages.

**PSYCH 505: History of Psychology**

(Dual-listed with PSYCH 405). (3-0) Cr. 3. S.

*Prereq: 4 courses in PSYCH*

Origins of psychology in philosophy, physiology, medicine and religion. Development as a scientific discipline during the nineteenth and twentieth centuries. Historical overview of clinical practice and theory.

**PSYCH 516: Advanced Cognition**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 316*

Theoretical models and empirical research in human cognition including perception, attention, memory, concepts/categorization, imagery, and judgment and decision making.

**PSYCH 519: Cognitive Neuropsychology**

(3-0) Cr. 3.

*Prereq: PSYCH 310 and PSYCH 316 or PSYCH 313; graduate classification or permission of instructor*

Psychological models and related neurological substrates underlying cognition in normal and brain-damaged individuals.

**PSYCH 521: Cognitive Psychology of Human Computer Interaction**

(Cross-listed with HCI). (3-0) Cr. 3.

*Prereq: Graduate classification or instructor approval*

Biological, behavioral, perceptual, cognitive and social issues relevant to human computer interactions.

**PSYCH 522: Scientific Methods in Human Computer Interaction**

(Cross-listed with HCI). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: PSYCH 521 and STAT 101 or equivalent*

Basics of hypothesis testing, experimental design, analysis and interpretation of data, and the ethical principles of human research as they apply to research in human computer interaction.

**PSYCH 533: Theories of Learning**

(Cross-listed with EDUC). (3-0) Cr. 3. F.

Major theories of learning and cognition in educational settings. Emphasis on behavioral, cognitive, constructivist, and sociocultural theories and their implications for educational policy and practice.

**PSYCH 538: Developmental Disabilities**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 9 credits in human development and family studies or psychology or permission of instructor*

Theories, research, and current issues regarding the intersection of development and disabilities. Investigation of interventions with individuals and families. (on-line course offering via Distance Education).

**PSYCH 542: Applied Psychological Measurement**

(3-0) Cr. 3. F.

*Prereq: PSYCH 440*

Principles of psychological measurement, including concepts of reliability and validity; interpretation of scores; factors influencing performance; test construction and use of measures of intelligence, ability, achievement, vocational interest, and personality. Ethical and multicultural issues in measurement.

**PSYCH 544: Cognitive Assessment**

(3-0) Cr. 3. F.S.

*Prereq: PSYCH 542 and admission into the PhD program in counseling psychology*

Principles, concepts, and methods of clinical interviewing, behavioral observation, and administration, scoring, and interpreting individual tests of cognitive function.



**PSYCH 560: Advanced Personality Psychology**

(3-0) Cr. 3.

*Prereq: 4 courses in psychology, including PSYCH 360*

Advanced analysis of contemporary theory and research on personality measurement, development, heritability, and social expression.

**PSYCH 562: Personality Assessment**

(3-0) Cr. 3.

*Prereq: PSYCH 360, PSYCH 440, PSYCH 542, and PSYCH 501 or STAT 401 and admission to the PhD program in counseling psychology*

Principles, concepts, and methods of personality assessment. Though not a practicum course, exposure is given to a variety of objective, projective, and situational tests.

**PSYCH 580: Advanced Social Psychology: Psychological Perspectives**

(3-0) Cr. 3.

*Prereq: 4 courses in psychology, including PSYCH 280*

Current theories, methods, and research in social psychology with an emphasis on cognitive and interpersonal processes such as attribution, social cognition, attitude change, attraction, aggression, and social comparison.

**PSYCH 589: Systems Neuroscience: Brain, Behavior, and Nutrition-Related Integrative Physiology**

(Cross-listed with FS HN, GERON, NEURO, NUTRS). Cr. 2. S.

*Prereq: Graduate standing, or undergraduate with consent of instructor.*

Structural, functional, and biochemical aspects of brain and non-motor behavior across the human lifespan. Types of neuroimaging used to assess the brain. Current research is leveraged to gauge how nutrition, diseases related to nutrition, and associated physiological processes influence the brain, particularly for common developmental, psychological, and neurological disorders.

**PSYCH 590: Special Topics**

Cr. arr. Repeatable.

*Prereq: 12 credits in psychology, and permission of instructor*

Guided reading on special topics or individual research projects in the following areas.

**PSYCH 590A: Special Topics: Counseling**

Cr. arr. Repeatable.

*Prereq: 12 credits in psychology, and permission of instructor*

**PSYCH 590Q: Special Topics: Cognitive**

Cr. arr. Repeatable.

*Prereq: 12 credits in psychology, and permission of instructor*

**PSYCH 590R: Special Topics: Social**

Cr. arr. Repeatable.

*Prereq: 12 credits in psychology, and permission of instructor*

**PSYCH 590Z: Special Topics: General**

Cr. arr. Repeatable.

*Prereq: 12 credits in psychology, and permission of instructor*

**PSYCH 592: Seminar in Psychology**

(1-0) Cr. 1-3. Repeatable.

*Prereq: 12 hours in psychology or graduate classification.*

Seminar in the following areas.

**PSYCH 592C: Seminar in Psychology: Developmental**

(1-0) Cr. 1-3. Repeatable. F.S.

*Prereq: 12 hours in psychology or graduate classification.*

**PSYCH 592P: Seminar in Psychology: Research Methods and Psychometrics**

(1-0) Cr. 1-3. Repeatable.

*Prereq: 12 hours in psychology or graduate classification.*

**PSYCH 592Z: Seminar in Psychology: General**

(1-0) Cr. 1-3. Repeatable.

*Prereq: 12 hours in psychology or graduate classification.*

**PSYCH 594: Quantitative Behavioral Methods**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems in the following areas.

**PSYCH 594A: Quantitative Behavioral Methods: Classical psychometric theory**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594B: Quantitative Behavioral Methods: Modern psychometric methods**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594C: Quantitative Behavioral Methods: Construct validation**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594D: Quantitative Behavioral Methods: Multi-dimensional scaling**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594E: Quantitative Behavioral Methods: Cluster Analysis**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594F: Quantitative Behavioral Methods: Meta-analysis**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594G: Quantitative Behavioral Methods: Longitudinal analysis**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594I: Quantitative Behavioral Methods: Focus Groups**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

**PSYCH 594K: Quantitative Behavioral Methods: Mediation and Moderation**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 594L: Quantitative Behavioral Methods: Missing Data**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent.*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 594M: Quantitative Behavioral Methods: Power Analysis**

(1-0) Cr. 1. F.S.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 594N: Quantitative Behavior Methods: Generalized Linear Models**

Cr. 1. S.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 594P: Quantitative Behavioral Methods: Systematic Review**

Cr. 1.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 594R: Quantitative Behavioral Methods: Practical Data Analysis**

Cr. 1. S.

*Prereq: PSYCH 501 or equivalent*

Specialized quantitative methods for social and behavioral research problems.

**PSYCH 595: Seminar in Social Psychology**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

Seminar in the following areas in social psychology.

**PSYCH 595A: Seminar in Social Psychology: Social Cognition**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595B: Seminar in Social Psychology: Aggression**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595C: Seminar in Social Psychology: Culture**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595D: Seminar in Social Psychology: Attitudes and Attitude Change**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595E: Seminar in Social Psychology: Psychology and Law**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595F: Seminar in Social Psychology: Health Psychology**

Cr. 1-3. Repeatable. Alt. S., offered irregularly.

*Prereq: 12 credits in Psychology*

**PSYCH 595G: Seminar in Social Psychology: Close Relationships**

Cr. 1-3. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595I: Seminar in Social Psychology: General**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 595J: Seminar in Social Psychology: Industrial Organizational Psychology**

Cr. 1-3. Repeatable. F.

*Prereq: 12 credits in Psychology*

**PSYCH 595K: Seminar in Social Psychology: Media Psychology**

Cr. 1-3. Repeatable. S.

*Prereq: 12 credits in Psychology*

**PSYCH 595L: Seminar in Social Psychology: Self and Identity**

Cr. 1-3. Repeatable.

*Prereq: 12 credits in Psychology*

**PSYCH 596: Seminar in Counseling Psychology**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

Seminar in the following areas in counseling psychology.

**PSYCH 596A: Seminar in Counseling Psychology: Supervision**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 596B: Seminar in Counseling Psychology: Research**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 596C: Seminar in Counseling Psychology: Multicultural**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 596D: Seminar in Counseling Psychology: Professional Issues and Ethics**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 596E: Seminar in Counseling Psychology: General**

Cr. arr. Repeatable. F.S.

*Prereq: 12 credits in Psychology*

**PSYCH 598: Seminar in Cognitive Psychology**

Cr. 0. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401.*

Seminar in the following areas in cognitive psychology.

**PSYCH 598A: Seminar in Cognitive Psychology: Attention and Perception**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598B: Seminar in Cognitive Psychology: Memory**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598C: Seminar in Cognitive Psychology: Cognitive Neuroscience**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598D: Seminar in Cognitive Psychology: Judgment and Decision Making**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598E: Seminar in Cognitive Psychology: Evolution**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598F: Seminar in Cognitive Psychology: Language**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598G: Seminar in Cognitive Psychology: Applied**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 598I: Seminar in Cognitive Psychology: General**

Cr. arr. Repeatable. F.S.

*Prereq: PSYCH 516, PSYCH 501 or STAT 401*

**PSYCH 599: Creative Component**

Cr. arr.

Offered on a satisfactory-fail basis only.

**Courses for graduate students:**

**PSYCH 605: Multi-level Modeling**

(Cross-listed with HD FS). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: HD FS 503 and HD FS 505 or STAT 404 or permission of instructor*

Rationale for and interpretation of random coefficient models. Strategies for the analysis of multi-level and panel data including models for random intercepts, random slopes, and growth curves.

**PSYCH 621: Psychological Counseling -Theory and Process**

(3-0) Cr. 3. F.

*Prereq: 3 courses in psychology and permission of instructor*

Overview of major counseling theories with emphases upon: key concepts of theories, the role of the counselor, and applications of theory in fostering client change.

**PSYCH 621L: Psychological Counseling -Theory and Process: Techniques in Counseling**

(0-6) Cr. 3. F.

*Prereq: permission of instructor required*

Development of basic counseling skills and techniques through observation, role-playing, case studies, and supervised counseling sessions.

**PSYCH 623: Vocational Behavior**

(3-0) Cr. 3.

*Prereq: 3 courses in psychology or graduate classification*

Theoretical views, research, and issues in career development through the life span. Methods of career counseling, including appraisal interviewing, assessment, test interpretation, and use of information sources.

**PSYCH 626: Group Counseling**

(2-2) Cr. 3.

*Prereq: Graduate classification*

Theory, research, ethical issues, and therapeutic considerations relevant to group counseling. Participation in lab exercises for development of group counseling skills and observation of ongoing groups.

**PSYCH 633: Teaching of Psychology**

(3-0) Cr. 3. S.

*Prereq: Enrollment in doctoral degree program in psychology and permission of instructor*

Orientation to teaching of psychology at college level: academic issues and problems, instructional and evaluative techniques.

**PSYCH 661: Adult Psychopathology**

(3-0) Cr. 3.

*Prereq: Doctoral student enrolled in the ISU Counseling Psychology program or by permission of the instructor.*

Examination of DSM and research based perspectives pertinent to the major forms of adult psychopathology including: anxiety, mood, psychotic, personality and other disorders. Coverage of research examining causes, development, and clinical issues concerning adult psychopathology.

**PSYCH 691: Practicum in Psychology**

Cr. arr. F.S.

*Prereq: Prereq: Permission of instructor*

Supervised practice and experience in the following fields of specialization in applied psychology.

**PSYCH 691A: Practicum in Psychology: Counseling (Beginning)**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: PSYCH 621L***PSYCH 691B: Practicum in Psychology: Counseling (Intermediate)**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of instructor, PSYCH 691A***PSYCH 691C: Practicum in Psychology: Counseling (Advanced)**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of instructor, PSYCH 691A, PSYCH 691B***PSYCH 691D: Practicum in Psychology: Counseling (Advanced External Practicum)**

Cr. 1-3. Repeatable. F.S.

*Prereq: Permission of instructor, PSYCH 691A, PSYCH 691B***PSYCH 691G: Practicum in Psychology: Group Counseling**

Cr. 1-3. F.S.

*Prereq: Prereq: Permission of instructor, PSYCH 626, PSYCH 691A***PSYCH 691S: Practicum in Psychology: Supervision**

Cr. 1-3. F.S.

*Prereq: Permission of instructor, PSYCH 592A, PSYCH 621L***PSYCH 691T: Practicum in Psychology: Teaching**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of instructor, PSYCH 633*

Offered on a satisfactory-fail basis only.

**PSYCH 691Z: Practicum in Psychology: General**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of instructor***PSYCH 692: Research Seminar**

(1-0) Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

Research seminar in the following areas.

**PSYCH 692A: Research Seminar: Counseling**

(1-0) Cr. 1-3. Repeatable.

*Prereq: Permission of instructor***PSYCH 692Q: Research Seminar: Cognitive**

(1-0) Cr. 1-3. Repeatable.

*Prereq: Permission of instructor***PSYCH 692R: Research Seminar: Social**

(1-0) Cr. 1-3. Repeatable.

*Prereq: Permission of instructor***PSYCH 692Z: Research Seminar: General**

(1-0) Cr. 1-3. Repeatable.

*Prereq: Permission of instructor***PSYCH 697: Internship in Counseling Psychology**

Cr. R.

*Prereq: Ph.D. candidacy in the Counseling Psychology program, approved dissertation proposal, and permission of instructor*

Full time supervised predoctoral internship experience in a setting relevant to counseling psychology.

**PSYCH 699: Research**

Cr. arr. Repeatable.

Offered on a satisfactory-fail basis only.

## Public Relations (P R)

***Any experimental courses offered by P R can be found at:***

registrar.iastate.edu/faculty-staff/courses/explistings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**P R 220: Principles of Public Relations**

(3-0) Cr. 3.

Introduction to public relations in business, government and non-profit organizations; functions, processes, and management; ethics, public opinion and theory.

**P R 301: Research and Strategic Planning for Advertising and Public Relations**

(Cross-listed with ADVRT). (3-0) Cr. 3.

*Prereq: ADVRT 230 or P R 220*

The use of primary and secondary research for situations, organizations and the public. Formation and development of strategic plans for public relations and advertising students.

**P R 305: Publicity Methods**

(3-0) Cr. 3.

*Prereq: ENGL 250; Sophomore classification*

Communication and publicity fundamentals and the use of media for publicity purposes. Not available to Greenlee School majors.

**P R 321: Public Relations Writing**

(2-2) Cr. 3.

*Prereq: Credit or concurrent enrollment in ADVRT 301 or P R 301; JL MC 110; minimum of C+ in JL MC 201*

Developing and writing public relations materials with an emphasis on media relations and news. Techniques addressed include media kits, brochures, newsletters, digital media and speeches.

**P R 324: Brand Storytelling**

(3-0) Cr. 3. F.S.

*Prereq: JL MC 201*

Combining critical journalism skills with persuasive tactics of public relations and advertising to tell inspiring brand stories. Introduction to transmedia storytelling that tells compelling stories shared with and by diverse audiences.

**P R 390: Professional Skills Development**

(Cross-listed with ADVRT, JL MC). Cr. 1-3. Repeatable, maximum of 6 credits. F.S.

*Prereq: Minimum of C+ in JL MC 201; other vary by topic. Instructor permission for non-majors.*

Check with Greenlee School for course availability.

**P R 391: Short Course Intensive**

(Cross-listed with ADVRT, JL MC). Cr. 1-3. Repeatable, maximum of 6 credits.

Focused short courses on timely concepts. Check with Greenlee School for course availability. Offered on a satisfactory-fail basis only.

**P R 420: Crisis Communication**

(3-0) Cr. 3.

*Prereq: P R 220*

Public relations strategies and tactics for crisis situations to protect and recover an organization's reputation: public behavior in crisis, crisis assessment, crisis communication plan, media training for leaders and spokespersons, apology strategy, corporate social responsibility, rumor in social media and reputation management.

**P R 424: Public Relations Campaigns**

(3-0) Cr. 3.

*Prereq: ADVRT 301 or P R 301; minimum of C+ in P R 321*

Developing public relations and public information campaigns for business and social institutions.

**P R 473: Social Media Strategy**

(Cross-listed with ADVRT, JL MC). (3-0) Cr. 3. F.S.

*Prereq: Junior classification*

The strategic use of social media, from both an advertising and public relationship standpoint, to the advantage of a client or organization. Examination and analysis of the social media space from a business perspective. Best practices in the areas of strategic planning, tactical execution, and measurement of social media platforms.

**P R 490: Independent Study in Communication**

Cr. arr.

*Prereq: Junior classification; Permission of Instructor*

Projects during which students may study problems associated with a medium, a professional specialization, a philosophical or practical concern, a reportorial method or writing technique, or a special topic in their field. Credit is not given for working on student or professional media without an accompanying research component. Contract with supervising professor required. No more than 3 credits of ADVRT/JLMC/PR 490 may be used toward a degree in the Greenlee School.

**P R 497: Special Topics in Communication**

(Cross-listed with ADVRT, JL MC). Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Seminars or one-time classes on topics of relevance to students in communication. See Schedule of Classes for topics.

**P R 499: Professional Media Internship**

Cr. 1-3. F.S.SS.

*Prereq: ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT majors; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in P R 321]); Advisor Approval*

See ADVRT/JL MC/P R 499A or 499B. Offered on a satisfactory-fail basis only.

**P R 499A: Professional Media Internship: Required**

Cr. 3. F.S.SS.

*Prereq:* ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT majors; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C + in P R 321]); *Advisor Approval*

Initial, required internship. A 400-hour (for 3 credits) internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

**P R 499B: Professional Media Internship: Optional**

Cr. 1-3. F.S.SS.

*Prereq:* ([JL MC major; JL MC 110; minimum of C+ in JL MC 302 or JL MC 303] or [ADVRT majors; JL MC 110; ADVRT 301 or P R 301; minimum of C+ in JL MC 201] or [P R major; JL MC 110; ADVRT 301 or P R 301; minimum of C + in P R 321]); *Advisor Approval*

Optional internship in the student's specialization. Assessment based on employer evaluations, student reports and faculty reviews. Available only to Greenlee School majors. Offered on a satisfactory-fail basis only.

## Religious Studies (RELIG)

*Any experimental courses offered by RELIG can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**RELIG 205: World Religions**

(Cross-listed with WLC). (3-0) Cr. 3. F.S.SS.

An introduction to religious studies – the academic study of religion. Religions from around the world will be discussed, including their myths, rituals, beliefs, values, and social forms.

Meets International Perspectives Requirement.

**RELIG 210: Religion in America**

(3-0) Cr. 3. F.S.SS.

Introductory study of the major beliefs, practices, and institutions of American Judaism, Catholicism, Protestantism, and Islam with emphasis on the diversity of religion in America, and attention to issues of gender, race, and class.

Meets U.S. Diversity Requirement

**RELIG 215: Religion and Popular Culture**

(3-0) Cr. 3. S.

Utilize the theories, skills, and methods of the academic study of religion to learn about religion in popular culture and how popular culture functions as a religion in modern society. Analysis of select films.

**RELIG 242: History of Christianity: Early to Medieval**

(3-0) Cr. 3. F.S.SS.

A survey of the major historical developments in Christian thought and practice that shaped Christianity from the time of Jesus through the late medieval period. Attention given to significant persons and major events, including those involving relations with Judaism and Islam.

Meets International Perspectives Requirement.

**RELIG 243: History of Christianity: Modern**

(3-0) Cr. 3. F.S.SS.

A survey of the major figures, events, and issues that shaped the historical development of Christianity from the Reformation era to the present. Explores the diverse social, political, and cultural movements within Christianity as a global religion.

**RELIG 277: Religion and Society**

(Cross-listed with SOC). (3-0) Cr. 3. S.

*Prereq:* SOC 134

Religion as a human construction, institution, activity, and identity. Connections between religion and other social institutions and processes.

Meets U.S. Diversity Requirement

**RELIG 321: The Hebrew Bible**

(3-0) Cr. 3. F.

An in-depth study of the literature and religion of ancient Israel in light of recent archaeological discoveries, research about the ancient Near East, and a variety of interpretations.

**RELIG 322: The New Testament**

(3-0) Cr. 3. S.

A detailed survey of the sacred scriptures of Christianity in light of recent archaeological discoveries and historical research about their Greco-Roman and Jewish background.

**RELIG 325: Religion, Law, and Justice**

(Cross-listed with C J, POL S). (3-0) Cr. 3. F.

A study of the role of religion in law and justice with a focus on the United States. Examines the history of religious freedom, key contemporary legal cases, and how religious-oriented justice movements engage ethics and the law.

**RELIG 328: Native American Religions**

Cr. 3.

An introduction to the beliefs and practices of Native American religious traditions, with attention to cultural, historical, and political contexts.



**RELIG 332: Catholicism**

(3-0) Cr. 3. F.

An explanation of the beliefs, spirit, and practices of Roman Catholicism, including its understanding of God, sacramentality, the human person, and community, and its relationship to other forms of Christianity and other world religions.

**RELIG 334: Africana Religions**

(Cross-listed with AF AM). (3-0) Cr. 3. F.

A focused study of the religious histories and cultures of West Africans and their descendants in the Americas. Topics include West African traditions, Christianity, Islam, and indigenous Afro-Caribbean religions, with attention to their gendered, theological, and cultural dimensions. Prior course work in Religious Studies or African American Studies recommended.

**RELIG 336: Religion, Sex and Gender**

(Cross-listed with WGS). (3-0) Cr. 3. F.

*Prereq: (3 credits in RELIG or WGS) or Permission of Instructor*

Gender and sexuality in the historical and contemporary contexts of various religious traditions.

Meets International Perspectives Requirement.

**RELIG 339: Goddess Religions**

(Cross-listed with WGS). (3-0) Cr. 3.

Focal study of selected global Goddess traditions in context, including American Goddess spirituality. Historical and cross-cultural images, identities, and discourses of female divinity.

**RELIG 340: Magic, Witchcraft, and Religion**

(Dual-listed with RELIG 540). (Cross-listed with ANTHR). (3-0) Cr. 3. S.

*Prereq: ANTHR 201 or ANTHR 306*

Survey of global religious belief and practice from an anthropological perspective. Emphasis on myth and ritual, shamanism, magic, witchcraft, beliefs in spirits, conceptions of the soul, mind and body relationships, and healing and therapeutic practices. Discussion of religious response to dramatic political and social change; effects of globalization on religious practice.

Meets International Perspectives Requirement.

**RELIG 348: Psychology of Religion**

(Cross-listed with PSYCH). (3-0) Cr. 3.

*Prereq: 9 credits in PSYCH*

Survey of psychological theory and research investigating religious and spiritual attitudes, beliefs and practices.

**RELIG 349: Cognitive Science of Religion**

(3-0) Cr. 3. S.

*Prereq: ENGL 250 or Permission of Instructor*

Using case studies from the world's religions, this course examines cross-culturally occurring forms of religious expression in light of humanistic and scientific researches in the cognitive science of religion (CSR). Topics may include beliefs in god and other supernatural beings, afterlife beliefs, morality, rituals, and religious experiences, among others. Prior coursework in Religious Studies or Psychology recommended. Meets International Perspectives Requirement.

**RELIG 350: Philosophy of Religion**

(Cross-listed with PHIL). (3-0) Cr. 3. F.

*Prereq: 6 credits in PHIL or Permission of Instructor*

The value and truth of religious life and belief. Mystical experience; religious faith and language; arguments for God's existence; the problem of evil; miracles; and religion and morality. Historical and contemporary readings.

**RELIG 352: Religions of India**

(Cross-listed with WLC). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

Study of texts, practices, beliefs, historical development, and mutual influence of a variety of the religious traditions of India. Emphasis on Vedic religion and the diversity of traditions of Classical Hinduism; survey of Buddhist, Jain, Sikh, and South Asian Islamic traditions.

Meets International Perspectives Requirement.

**RELIG 358: Islam**

(Cross-listed with WLC). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

An introduction to Islamic religion, culture, and society from its origins to the present. Topics include the Quran, the Prophet Muhammad, Islamic theology and philosophy, Islamic history, and Islam in America.

Meets International Perspectives Requirement.

**RELIG 359: The Quran**

(Cross-listed with WLC). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

A study of the Quran, the sacred text of Islam, with attention to its history, its major themes, and the diverse ways it is interpreted and applied.

Meets International Perspectives Requirement.

**RELIG 360: Religion and Ethics**

(3-0) Cr. 3.

Investigation of comparative religious ethical theories and approaches to contemporary moral issues. Exploration of the connections between religious belief, identity, and moral practice.

**RELIG 367: Christianity in the Roman Empire**

(Cross-listed with CL ST). (3-0) Cr. 3.

An historical introduction to the rise of Christianity in the Roman empire, with special attention to the impact of Greco-Roman culture on the thought and practice of Christians and the interaction of early Christians with their contemporaries.

**RELIG 368: Religions of Ancient Greece and Rome**

(Cross-listed with CL ST). Cr. 3.

Nature, origins and development of religious beliefs and practices in ancient Greece and Rome from earliest times up to the rise of Christianity. Roles of divinities and rituals in lives of individuals and families and the governing of city-states and empires. Emphasis on historical contexts of the Graeco-Roman world and influences of neighboring cultures in Africa and Asia. None.

Meets International Perspectives Requirement.

**RELIG 370: Religion and Politics**

(Cross-listed with POL S). (3-0) Cr. 3. F.

The interaction of religion and politics in the U.S. from both an historical and contemporary perspective, as well as the role of religion in politics internationally.

**RELIG 380: Catholic Social Thought**

(3-0) Cr. 3. S.

Examines biblical roots of and major developments in Catholic social thought. Contemporary issues such as human rights, economic justice, the environment, and war and peace will be treated using principles of Catholic ethics, social analysis, official church documents, and contributions of notable theologians and activists.

**RELIG 389: Exhibiting Religion**

(Cross-listed with ANTHR). (3-0) Cr. 3.

Display of religion in museums, fairs, and exhibitions. History and ethics of museum collecting, storage, display, public engagement, and repatriation. Visit local museums and explore digital galleries.

**RELIG 475: Seminar: Issues in the Study of Religion**

(3-0) Cr. 3. Repeatable, maximum of 6 times.

*Prereq: 6 credits in RELIG or Permission of Instructor*

Topic changes each time offered. Closed to freshmen. Sophomores must have approval of instructor.

**RELIG 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in RELIG; Permission of Instructor*

Guided reading and research on special topics selected to meet the needs of advanced students. No more than 9 credits of Relig 490 may be counted toward graduation.

**RELIG 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: 6 credits in RELIG; Permission of Instructor*

Guided reading and research on special topics selected to meet the needs of advanced students. No more than 9 credits of Relig 490 may be counted toward graduation.

**RELIG 491: Senior Thesis**

Cr. 3.

*Prereq: Permission of Instructor*

Written under the supervision of a Religious Studies faculty advisor.

**RELIG 494: Special Studies in Religious Research Languages**

Cr. 2-3. Repeatable.

*Prereq: 6 credits in RELIG; Permission of Instructor*

**Courses primarily for graduate students, open to qualified undergraduates:**

**RELIG 540: Magic, Witchcraft, and Religion**

(Dual-listed with RELIG 340). (Cross-listed with ANTHR). (3-0) Cr. 3. S.

*Prereq: ANTHR 201 or ANTHR 306*

Survey of global religious belief and practice from an anthropological perspective. Emphasis on myth and ritual, shamanism, magic, witchcraft, beliefs in spirits, conceptions of the soul, mind and body relationships, and healing and therapeutic practices. Discussion of religious response to dramatic political and social change; effects of globalization on religious practice.

Meets International Perspectives Requirement.

**RELIG 590: Special Topics in Religious Studies**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor, 9 credits in religious studies*

## Research and Evaluation (RESEV)

**Any experimental courses offered by RESEV can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**RESEV 550: Introduction to Educational Research**

(3-0) Cr. 3. F.S.SS.

Understanding the nature of quantitative and qualitative research; reviewing the literature; developing research problems and questions; research designs; data collection and analysis issues; evaluating research studies.

**RESEV 552: Basic Educational Statistics**

(3-0) Cr. 3. F.

Statistical concepts and procedures for analyzing educational data; descriptive statistics, correlation, t tests, and chi square with computer applications.

**RESEV 553: Intermediate Educational Statistics**

(3-0) Cr. 3.

*Prereq: RESEV 552 or STAT 401 or STAT 587*

A continuation of statistical concepts and procedures for analyzing educational data, using multiple regression and logistic regression.

**RESEV 554: Intermediate Research Methods**

(3-0) Cr. 3. F.SS.

*Prereq: RESEV 553 or STAT 404*

Intermediate quantitative research methodology in preparation for carrying out thesis and dissertation research, with an emphasis on the estimation of causal effects using observational data.

**RESEV 570: Surveys in Educational Research**

(3-0) Cr. 3. S.

*Prereq: RESEV 552 or equivalent*

Examination of survey design and administration in educational research. Designing surveys; developing, evaluating, and asking survey questions; survey sampling; measuring survey reliability and validity; administering mail and web surveys; decreasing survey nonresponse; conducting post-collection survey data processing; conducting survey research with integrity.

**RESEV 580: Introduction to Qualitative Research Methodology**

(3-0) Cr. 3.

Qualitative research in the human sciences, emphasizing education; principles of qualitative inquiry, including theoretical foundations, research design, and fieldwork.

**RESEV 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate standing*

Guided reading and in research and evaluation study on special topic.

**RESEV 591: Supervised Field Experience**

Cr. 2-4. Repeatable.

*Prereq: RESEV 553 or RESEV 680*

Supervised on the job field experience.

**RESEV 593: Workshop**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate standing*

Intensive, concentrated exposure to a special educational research or evaluation problem.

**RESEV 597: Program Assessment and Evaluation**

(3-0) Cr. 3. S.

*Prereq: RESEV 550*

Evaluation models and professional standards. Techniques of evaluating educational programs. Emphasis on both theory and practical applications.

**Courses for graduate students:**

**RESEV 601: Foundations of Educational Inquiry**

(3-0) Cr. 3. F.

*Prereq: Admission to a doctoral program.*

Required course for all School of Education PhD students that introduces students into the community of educational scholars with a focus on: 1) the history of education as an academic field of study; (2) the philosophical underpinnings of social scientific and educational inquiry; and (3) the contemporary methodological landscape of the field of education.

**RESEV 603: Foundations of Qualitative Inquiry in Education**

Cr. 3. S.

*Prereq: RESEV 601*

Focus on the nature of qualitative research, including the ways in which knowledge is produced through qualitative methodologies, the theoretical and epistemological underpinnings of qualitative research, the importance of theoretical and/or conceptual frameworks in qualitative research, and the various methodological approaches to qualitative research.

**RESEV 604: Advanced Qualitative Inquiry in Education**

(3-0) Cr. 3. F.

*Prereq: RESEV 603*

Conceptions of data and analysis in qualitative methodologies; focus on applied topics in qualitative data analysis. Combination format of reading and discussion seminars and classroom workshops focusing on individual research projects (not for thesis or dissertation).

**RESEV 615: Current Topics in Research and Evaluation**

Cr. 1-3. Repeatable.

**RESEV 620: College Access in Policy, Practice, and Research**

(4-0) Cr. 1-3. SS.

Exploration of the plurality of frameworks used to conceptualize college access as a social problem (for research, policy, and practice). Development of application of understandings of college access frameworks to policy, practice, and research.

**RESEV 680: Critical Qualitative Research**

(3-0) Cr. 3. S.

*Prereq: one course in qualitative research*

Feminist, indigenous, critical, queer, and other perspectives are used to raise important questions about qualitative research and help us rethink dilemmas of voice, appropriation, collaboration, and difference, and consider ethical and political issues that arise when engaging in research. Readings and assignments will concentrate on reciprocity, reflexivity, decolonization of research methods, and the necessity of engaging in culturally responsive and ethically informed research, particularly when working with colonized or marginalized communities, and when we aim to produce knowledge in the service of social justice and social change.

**RESEV 681: Analytical Approaches in Qualitative Inquiry**

(3-0) Cr. 3. F.

*Prereq: RESEV 580 or equivalent*

Conceptions of data and analysis in qualitative methodologies; focus on applied topics in qualitative data analysis, such as narrative analysis, ethnographic analysis, life history analysis, postmodern analyses, discourse analysis, arts-based analytical strategies, constructing data; combination format of reading and discussion seminars and classroom workshops focusing on individual research projects (not for thesis or dissertation).

**RESEV 690: Advanced Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Graduate standing*

Guided reading and/or study on special topics of an advanced nature.

**RESEV 699: Research**

Cr. arr. Repeatable. F.S.SS.

## Russian (RUS)

*Any experimental courses offered by RUS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****RUS 101: Introduction to Russian Language and Culture I**

(4-0) Cr. 4. F.

Introduction to the Russian language (focusing on the development of speaking, listening, reading and writing skills) and Russian culture.

**RUS 102: Introduction to Russian Language and Culture II**

(4-0) Cr. 4. S.

*Prereq: RUS 101*

Continuation of RUS 101. Introduction to the Russian language (focusing on the development of speaking, listening, reading and writing skills) and Russian culture.

Meets International Perspectives Requirement.

**RUS 201: Intermediate Russian I**

(4-0) Cr. 4. F.

*Prereq: RUS 102*

Thorough review of grammar and growth of vocabulary. Selected readings. Continued use of the four basic skills.

Meets International Perspectives Requirement.

**RUS 202: Intermediate Russian II**

(4-0) Cr. 4. S.

*Prereq: RUS 201*

Thorough review of grammar and growth of vocabulary. Selected readings. Continued use of the four basic skills.

Meets International Perspectives Requirement.

**RUS 301: Composition and Conversation**

(3-0) Cr. 3. F.

*Prereq: RUS 202*

Thorough study of the Russian language, with emphasis on strengthening proficiency in writing, speaking, reading, and listening.

Increased focus on syntax and word formation.

Meets International Perspectives Requirement.

**RUS 304: Russian for Global Professionals**

(3-0) Cr. 3. F.

*Prereq: RUS 102*

Communication in business and professional contexts in Russian-speaking countries. Development of effective communication strategies and project management in the workplace. Cultural contexts of business and professional practice.

Meets International Perspectives Requirement.

**RUS 314: Reading Russian Literary and Cultural Texts**

(3-0) Cr. 3. Repeatable.

*Prereq: RUS 102*

Selected readings in Russian literature and culture. Emphasis on techniques of reading and analysis of literary and cultural texts.

Meets International Perspectives Requirement.

**RUS 370: Russian Studies in English Translation**

(3-0) Cr. 3. Repeatable.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English.

Meets International Perspectives Requirement.

**RUS 370A: Russian Studies in English Translation: Topics in Russian Literature**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Focus on Russian literature. Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. Meets International Perspectives Requirement.

**RUS 370B: Russian Studies in English Translation: Russian Fairy Tales**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Focus on Russian fairy tales. Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. Meets International Perspectives Requirement.

**RUS 370R: Studies in English Translation: Russian Topics on Women or Feminism**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. Meets International Perspectives Requirement.

**RUS 375: Russia Today**

(3-0) Cr. 3. Repeatable.

A survey of social, political, economic, and cultural topics relevant to contemporary Russia. Readings, discussions and papers in English. Meets International Perspectives Requirement.

**RUS 378: Russian Film Studies in English**

(3-0) Cr. 3.

Analysis and interpretation of cinema in Russia and the Soviet Union. Topics vary according to faculty interest. Film directors, genres, movements, historical survey, aesthetics, and cinematography. Readings, discussions and papers in English. Meets International Perspectives Requirement.

**RUS 395: Study Abroad**

Cr. 1-6. Repeatable.

Supervised instruction in language and culture of Russia; formal class instruction at level appropriate to student's training, augmented by practical living experience. Meets International Perspectives Requirement.

**RUS 490: Independent Study**

Cr. 1-6. Repeatable.

*Prereq: 6 credits in RUS; Permission of Department Chair*

Designed to meet the needs of students who seek work in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 9 credits of RUS 490 may be counted toward graduation.

**RUS 499: Internship in Russian**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits of RUS at the 300-level; Permission of Advisor and WLC Internship Coordinator*

Work experience using Russian language skills in the public or private sector combined with academic work under faculty supervision. Available only to minors. No more than 3 credits may be applied to the minor.

**Courses primarily for graduate students, open to qualified undergraduates:**

**RUS 590: Special Topics in Russian**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Russian*

**RUS 590A: Special Topics in Russian: Literature or Literary Criticism**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Russian*

**RUS 590B: Special Topics in Russian: Linguistics**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Russian*

**RUS 590C: Special Topics in Russian: Language Pedagogy**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Russian*

**RUS 590D: Special Topics in Russian: Civilization**

Cr. 2-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Russian*

## Seed Technology and Business (STB)

***Any experimental courses offered by STB can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**STB 501: Strategic Management**

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Critical analysis of current practice and case studies in strategic management with an emphasis on integrative decision making. Strategy formulation and implementation will be investigated in the context of complex business environments.

**STB 503: Information Systems**

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Introduction to a broad variety of information systems (IS) topics, including current and emerging developments in information technology (IT), IT strategy in the context of corporate strategy, and IS planning and development of enterprise architectures. Cases, reading, and discussions highlight the techniques and tactics used by managers to cope with strategic issues within an increasingly technical and data-driven competitive environment.

**STB 504: Marketing and Logistics**

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Integration of the business functions concerned with the marketing and movement of goods along the supply chain with the primary goal of creating value for the ultimate customer. Coordination of marketing, production, and logistics activities within the firm and with outside suppliers and customers in the supply chain.

**STB 507: Organizational Behavior**

(Cross-listed with BUSAD). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Understanding human behavior in organizations, and the nature of organizations from a managerial perspective. Special emphasis on how individual differences, such as perceptions, personality, and motivation, influence individual and group behavior in organizations and on how behavior can be influenced by job design, leadership, groups, and the structure of organizations.

**STB 508: Accounting and Finance**

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of fundamental topics in accounting and finance. Financial statement reporting and analysis for agriculture firms, corporate governance issues related to financial reporting, (e.g., Sarbanes-Oxley). Basic tools and techniques used in financial management, including stock and bond valuation. How to assess and use capital budgeting methods to evaluate proposed firm investments.

**STB 509: International Seed Business Practices, Policies, & Regulation**

(Cross-listed with BUSAD). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Cultural, financial, economic, political, legal/regulatory environments shaping an organization's international business strategy. Topics include entry (and repatriation) of people, firms, goods, services, and capital. Special attention to the institutions of seed regulation and policy. Ethical issues facing managers operating in an international context.

**STB 510: Crop Improvement**

(Cross-listed with AGRON). (3-0) Cr. 3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

A study of agriculture from its origins with the domestication of crop plants through basic genetics, demonstrating the challenges and elements of breeding strategies intended to manage gene x environmental interactions. Elements of biotechnology including use of molecular markers, development of genetically modified cultivars, gene mapping, cloning, and gene editing will be covered. Methods to measure the effectiveness of plant breeding (genetic gain) and the impact of improved agronomic practices contributing to increased agricultural productivity will be covered. Use of intellectual property protection, and the conservation and utilization of exotic genetic resources.

**STB 513: Data Science for Agricultural Professionals**

(Cross-listed with AGRON). (3-0) Cr. 3. F.S.

*Prereq: AGRON 181 or equivalent, MATH 140, STAT 104*

Quantitative methods for analyzing and interpreting agronomic information. Principles of experimental design, hypothesis testing, analysis of variance, regression, correlation, and graphical representation of data. Use of SAS and Excel for organization, analyzing, and presenting data.



**STB 534: Seed and Variety, Testing and Technology**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The components of seed quality and how they are assessed in the laboratory, including traits derived from modern biotechnology. The impact of new technologies on seed quality testing. Variety maintenance procedures and breeder seed. Variety identification: phenotype and grow-out trials, isozyme testing, and DNA marker testing. Procedures for evaluating varieties. The variance tests appropriate for fixed effects analysis of variance. Statistical inference and stratification for yield trials. Use of strip plot testing.

**STB 535: Introduction to the Seed Industry**

Cr. 1.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

This introductory course is a quick overview of the academic program and the seed industry. It describes how the STB program components relate to the seed industry scope; the role of the seed industry in global agriculture and society; public and private institutions involved in seed research, development, and regulation; quality management for seed products. Current issues including industry consolidation, ethical and economic issues related to biotechnology, and incorporation of digital technology in the seed business will be discussed by course instructors and guest lecturers from the seed industry.

**STB 536: Quantitative Methods for Seed**

(Cross-listed with AGRON). (2-0) Cr. 2. F.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Quantitative Methods for analyzing and interpreting agronomic and business information for the seed industry. Principles of experimental design and hypothesis testing, regression, correlation, analysis of variance, and graphical representation of data. Use of spreadsheets and statistical software for manipulating, analyzing and presenting data.

**STB 539: Seed Conditioning and Storage**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

The technical operations which may be carried out on a seed lot from harvest until it is ready for marketing and use. The opportunities for quality improvement and the risks of deterioration which are present during that time. Analysis of the costs of and benefits of operations. Evaluation of equipment based on benefits to the customer and producer. Interpretation of the role of the conditioning plant and store as a focal points within the overall operations of a seed company.

**STB 543: Seed Physiology**

(Cross-listed with HORT). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Brief introduction to plant physiology. Physiological aspects of seed development, maturation, longevity, dormancy and germination. Links between physiology and seed quality.

**STB 547: Seed Production**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Survey of crop production; including management of soil fertility, planting dates, populations, weed control, and insect control. Analysis of the principles of seed multiplication and the key practices which are used to ensure high quality in the products. Field inspection procedures and production aspects that differ from other crop production. Foundation seed production. Analysis of the typical organization of field production tasks. Survey of the differences in seed production strategies between crops and the impact of these differences on seed production.

**STB 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Admission to the Graduate Program in Seed Technology and Business*  
Guided instruction and self-study on special topics relevant to seed technology and business.

**STB 592: Seed Health Management**

(Cross-listed with PL P). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Occurrence and management of diseases during seed production, harvest, conditioning, storage, and planting. Emphasis on epidemiology, disease management in the field, seed treatment, effects of conditioning on seed health, and seed health testing. Credit may not be obtained for both PI P/STB 592 and PI P 594.

**STB 595: Seed Quality, Production, and Research Management**

(Cross-listed with AGRON). (2-0) Cr. 2.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

Advanced survey of the organization, staff capabilities and management characteristics typical in seed production and crop improvement in seed enterprises. Analysis of the use of quality information in the management of seed operations and sales. Process management applications for seed. Production planning for existing capacity. Analysis of the manager's tasks in the annual cycle and how the tasks of these managers relate to the general categories of business management roles. Difference in management strategies used with different situations and groups of employees.

**STB 599: Creative Component**

Cr. 1-3.

*Prereq: Admission to the Graduate Program in Seed Technology and Business or approval of instructor must be obtained.*

A written report based on research, library readings, or topics related to the student's area of specialization and approved by the student's advisory committee.

## Sociology (SOC)

***Any experimental courses offered by SOC can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**SOC 110: Orientation to Agricultural and Rural Policy Studies**

(1-0) Cr. 1. F.

Orientation to Agriculture and Society major. Familiarization with University and CALS College requirements. Exploration of career tracks and career planning. Recommended during first semester of freshman year or as soon as possible after transfer into the department.

**SOC 115: Orientation to Sociology**

(1-0) Cr. 1. F.S.

Orientation to sociology. A familiarization with University and LAS College requirements and procedures. Occupational tracks and career options open to sociology; introduction to career planning. Recommended during first semester of freshman year, or as soon as possible after transfer into the department. Offered on a satisfactory-fail basis only.

**SOC 134: Introduction to Sociology**

(3-0) Cr. 3. F.S.SS.

Social interaction and group behavior with emphasis on the scientific study of contemporary U.S. society, including issues relating to socialization, inequality, and changing rural and urban communities. Analysis of relationships among the institutions of family, religion, political participation, work, and leisure.

**SOC 134H: Introduction to Sociology: Honors.**

(3-0) Cr. 3. F.S.SS.

Social interaction and group behavior with emphasis on the scientific study of contemporary U.S. society, including issues relating to socialization, inequality, and changing rural and urban communities. Analysis of relationships among the institutions of family, religion, political participation, work, and leisure.

**SOC 210: Social & Civic Innovation**

(3-0) Cr. 3. S.

Learn how to infuse innovation and entrepreneurship into social and civic problems. Students will be introduced to solution-oriented ways of thinking, grounded in sociology, data-driven methodologies, and the design thinking paradigm. Explore real-world case studies and methods in the US and international social contexts. Special attention is given to novel policies, programs, and interventions that address the challenges and opportunities of rural places.

**SOC 219: Families and Intimate Relationships**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Exploration of families and intimate relationships using a sociological perspective, with the goal to help students make informed and intentional choices in their relationships across the life course. Topics covered include family definitions and theories, sexuality, singlehood, dating, cohabitation, marriage, parenting, divorce, stepfamilies, and aging. Relationship quality, communication, conflict, and work-life balance will also be examined, as well as differences in family dynamics by gender, race and ethnicity, and class.

**SOC 220: Globalization and Sustainability**

(Cross-listed with ANTHR, ENV S, GLOBE, M E, MAT E). (3-0) Cr. 3. F.S.

An introduction to understanding the key global issues in sustainability. Focuses on interconnected roles of energy, materials, human resources, economics, and technology in building and maintaining sustainable systems. Applications discussed will include challenges in both the developed and developing world and will examine the role of technology in a resource-constrained world. Cannot be used for technical elective credit in any engineering department.

Meets International Perspectives Requirement.

**SOC 230: Rural Society in Transition**

(3-0) Cr. 3. F.S.

Introduction to the causes and consequences of social and economic change affecting rural people and places. Uses a sociological perspective to examine social structures, social change, and social relationships within rural society. Topics include community, population change, inequality, rural economy, structure of agriculture, social and environmental impacts of resource extraction.

**SOC 235: Social Problems and American Values**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Sociological concepts, theories and methods to analyze the causes and consequences of social problems. Social problems discussed may include crime, substance abuse, income inequalities, discrimination, poverty, race relations, health care, family issues, and the environment. How American culture and values shape societal conditions, public discourse and policy.

**SOC 241: Youth and Crime**

(Cross-listed with C J). (3-0) Cr. 3. F.

An examination of delinquency that focuses on the relationship between youth as victims and as offenders, social and etiological features of delinquency, the role of the criminal justice system, delinquents' rights, and traditional and alternative ways of dealing with juvenile crime.

**SOC 262: Data Discovery and Civic Engagement**

(3-0) Cr. 3. S.

Experiential learning course on how to use data presentation and civic engagement skills to address issues in agricultural and rural policy. Data skills include accessing and analysis of public data, and creating effective charts and maps. Engagement skills include facilitating conversations among diverse stakeholders, generating and prioritizing ideas, and managing conflict on divisive issues. Students will produce short policy briefs and civic engagement plans on agricultural and rural issues.

**SOC 264: Facilitation of Public Issues in Agriculture**

(3-0) Cr. 3. F.

Experiential learning course on how to use public facilitation skills to address issues in agricultural and rural policy. Skills include ensuring participation among diverse audiences, generation and prioritization of ideas, facilitating discussions and managing conflict, and building consensus to make decisions. Students will practice these skills with relevant stakeholder groups.

**SOC 277: Religion and Society**

(Cross-listed with RELIG). (3-0) Cr. 3. S.

*Prereq: SOC 134*

Religion as a human construction, institution, activity, and identity. Connections between religion and other social institutions and processes.

Meets U.S. Diversity Requirement

**SOC 302: Research Methods for the Social Sciences**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134; credit or concurrent enrollment in STAT 101*

Introduction to the principal research methods used in sociology, including survey research, interviewing, content analysis, experiments, ethnographies, focus groups, historical analysis, and analysis of secondary data. Instruction on sampling and the principles of validity and reliability underlying quantitative and qualitative methods. Training in data analysis using statistical software packages.

**SOC 305: Social Psychology: A Sociological Perspective**

(3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Examination of human behavior in a social environment with emphasis on development of the self, interpersonal relations, attitudes, and small groups.

**SOC 310: Community**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Analysis of evolving theory and research of community as an ideal type, an ecological system, a political economy, and an interactional field; examination of the impact of economic, cultural, social and political infrastructures on community power structures and change processes in a global era.

**SOC 325: Agriculture in Transition**

(3-0) Cr. 3. S.

The impacts of socioeconomic and agricultural changes on farm families, rural communities, and consumers. Past, present, and future trends in farm structures, the U.S. agrifood system, and their social implications including ethics and policy options.

**SOC 327: Gender and Sexualities in Society**

(Cross-listed with WGS). (3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Develop a foundational understanding of the role of gender and sexuality in society. Students will explore the biological, social, and cultural meanings of gender and sexuality and their intersections with class, race/ethnicity, ability, socioeconomic status and other identities. Contemporary social science research, theories, and feminist perspectives as they relate to gender and sexuality, and explores gender and sexuality within families, education, the media, politics, and the economy.

**SOC 328: Sociology of Masculinities and Manhood**

(Cross-listed with WGS). (3-0) Cr. 3. S.

*Prereq: SOC 134 or WGS 201*

Examination of socially constructed and idealized images of manhood, the nature of social hierarchies and relations constructed on the basis of imagery, ideologies, and norms of masculinity. Theories on gender (sociological, psychological, and biological). Particular attention given to theory and research on gender variations among men by race, class, ethnicity, sexual orientation, physical ability and age.

**SOC 330: Ethnic and Race Relations**

(Cross-listed with AF AM). (3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Analysis of ethnic and race relations, particularly in America; emphasis on the sociology and psychology of race and ethnic relations.

**SOC 331: Social Class and Inequality**

(3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Social stratification and processes resulting in social and economic inequalities; implications of status, class, and poverty for people of different races, ethnicities, and gender.

**SOC 332: The Latino/Latina Experience in U.S. Society**

(3-0) Cr. 3. F.

*Prereq: SOC 134*

Examination of the social, historical, economic and political experience of varied Latino ethnic groups in the U.S. - primarily focusing on Mexican, Puerto Ricans, and Cubans.

**SOC 334: Politics and Society**

(Cross-listed with POL S). (3-0) Cr. 3. F.

*Prereq: A course in political science or sociology*

The relationship between politics and society with emphasis on American society. Discussion of theories of inequality, power, social movements, elites, ruling classes, democracy, and capitalism.

**SOC 340: Deviant and Criminal Behavior**

(Cross-listed with C J). (3-0) Cr. 3. S.SS.

*Prereq: C J 240 or SOC 134*

Theory and research on the etiology of types of social deviance; issues relating to crime, antisocial behavior and social policies designed to control deviant behavior.

**SOC 345: Population and Society**

(Cross-listed with ENV S). (3-0) Cr. 3. F.

*Prereq: SOC 134*

Human population growth and structure; impact on food, environment, and resources; gender issues; trends of births, deaths, and migration; projecting future population; population policies and laws; comparison of the United States with other societies throughout the world. Meets International Perspectives Requirement.

**SOC 348: Global Poverty, Resources and Sustainable Development**

Cr. 3.

*Prereq: Soc 134*

Trends in hunger, poverty, resource use and development. Assessment of theories, policies, and programs to promote sustainable livelihoods, resource management, and development at local and national levels. Examine solutions through institutional efforts and grassroots social movements.

Meets International Perspectives Requirement.

**SOC 350: Human Diversity in Agriculture and the Food System**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134 or SOC 230 or permission of instructor.*

Role of under-represented groups in agriculture and the food system from a sociological perspective, with a focus on the United States. Analysis of the status, contributions, and barriers of farmers and farm workers who identify as women, under-represented racial and ethnic groups, LGBTQ, and lower income. Discussion of historical and current issues.

**SOC 362: Applied Ethics in Agricultural and Rural Development**

(3-0) Cr. 3.

*Prereq: ECON 101 or SOC 134; Junior or Senior classification; College of Agriculture and Life Sciences major*

Explore ethics of policy development and program implementation in agricultural and rural development. Focus in U.S. and international contexts. Identify major ethical issues and dilemmas in policy and programs. Discuss and debate proper ethical behaviors when working with policy-makers, NGOs, farmers, and rural communities.

**SOC 380: Sociology of Work**

(3-0) Cr. 3. F.S.

*Prereq: SOC 134*

Inequalities (gender, race, class) related to jobs, occupations, firms, and industries. Satisfactions, rewards, alienation, discrimination, and other topics of importance to workers are examined.

**SOC 382: Environmental Sociology**

(Cross-listed with ENV S). (3-0) Cr. 3. F.S.

*Prereq: 3 credits of ENV S or SOC 134*

Environment-society relations; social construction of nature and the environment; social and environmental impacts of resource extraction, production, and consumption; environmental inequality; environmental mobilization and movements; U.S. and international examples.

Meets International Perspectives Requirement.

**SOC 401: Contemporary Sociological Theories**

(3-0) Cr. 3. F.S.SS.

*Prereq: 9 credits in SOC*

Both historical and modern social theories as applied to understanding and researching the social world.

**SOC 410: Human Trafficking**

(Dual-listed with SOC 510). (Cross-listed with WGS). Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Issues related to human trafficking and modern-day slavery in the US and world. History of and concepts defining forms of violence experienced by trafficking victims and methods used to recruit and control victims. Students will learn how to educate others about this crime against humanity. Examines international, federal, and state legislation to prevent human trafficking. Only one of WGS 410 may count toward graduation

**SOC 411: Social Change in Developing Countries**

(3-0) Cr. 3. S.

*Prereq: SOC 134 plus 3 credits in social sciences*

Social change and development in developing countries; international interdependence; causes and consequences of persistent problems in agriculture, city growth, employment, gender equality, basic needs; local and worldwide efforts to foster social change and international development.

Meets International Perspectives Requirement.

**SOC 415: Agrifood Policy and Social Change**

(3-0) Cr. 3. S.

*Prereq: SOC 134 or SOC 230 or SOC 325*

Historical and current agricultural and food policies are studied from domestic perspectives. Governance of agrifood systems by governments and other institutions are examined in terms of rationale, content, and consequences. Social science frameworks are used to assess the impacts of governance policies on agricultural producers, rural communities, and consumers.

**SOC 433: Strategies for Rural Resiliency and Vitality**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SOC 230 or Permission of Instructor*

(Dual-listed with SOC 533). Experiential learning course on community resiliency and vulnerability. Focus on economic, social, cultural, environmental, and spatial dimensions of communities. Examine impact of local strategies and state and national policies on resiliency. Project-based work with communities and agencies. Applications using data discovery and survey research methods.

**SOC 444: Sociology of Food and Agricultural Systems**

(Dual-listed with SOC 544). (3-0) Cr. 3.

*Prereq: SOC 325 or graduate standing*

Social organization of food and fiber production, processing, and distribution systems. Sociological comparison of conventional and alternative production systems; gender roles in agriculture and food systems; local, national and global food systems; perspectives on food and agricultural research and policy.

**SOC 460: Criminal and Juvenile Justice Internship**

(Cross-listed with C J). Cr. 3-9. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: Junior or Senior classification; major or minor in Criminal Justice or Sociology*

Study of the criminal and juvenile justice systems and social control processes. Supervised placement in a police department, prosecutor's office, court, probation and parole department, penitentiary, juvenile correctional institution, community-based rehabilitation program, or related agency. Assessed service learning component. Offered on a satisfactory-fail basis only. No more than a total of 9 credits of 460 can be counted toward graduation.

**SOC 464: Strategies for Community Engagement**

(3-0) Cr. 3. S.SS.

*Prereq: 6 credits in SOC*

Project-focused engagement in community issues and initiatives. A broad range of strategies will be addressed, including popular education, applied research, network analysis and mapping, policy focused work, action research, curriculum development, community organizing, and organizational development.

**SOC 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SOC; Permission of Instructor*

Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation. Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation.

**SOC 490A: Independent Study: General Sociology**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SOC; Permission of Instructor*

Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation. Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation.

**SOC 490B: Independent Study: Rural Sociology**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SOC; Permission of Instructor*

Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation. Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation.

**SOC 490E: Independent Study: Senior Seminar**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SOC; Permission of Instructor*

Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation. Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation.

**SOC 490H: Independent Study: Honors**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SOC; Permission of Instructor*

Students in the College of Agriculture must be of junior or senior classification and may use no more than 6 credits of Soc 490 toward the total of 128 credits required for graduation. Students in the College of Liberal Arts and Sciences may count no more than 9 credits of 490 toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**SOC 506: Classical Sociological Theory**

(3-0) Cr. 3.

*Prereq: SOC 401*

The origins of the canonical works of sociology in the mid-Industrial Revolution period including Karl Marx, Max Weber, Emile Durkheim and others.

**SOC 509: Agroecosystems Analysis**

(Cross-listed with AGRON, SUSAG). (3-4) Cr. 4. F.

*Prereq: Senior or above classification; permission of instructor*

Experiential, interdisciplinary examination of Midwestern agricultural and food systems, emphasizing both field visits and classroom activities. Focus on understanding multiple elements, perspectives (agronomic, economic, ecological, social, etc.), and scales of operation.

**SOC 510: Human Trafficking**

(Dual-listed with SOC 410). (Cross-listed with WGS). Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Issues related to human trafficking and modern-day slavery in the US and world. History of and concepts defining forms of violence experienced by trafficking victims and methods used to recruit and control victims. Students will learn how to educate others about this crime against humanity. Examines international, federal, and state legislation to prevent human trafficking. Only one of WGS 410 may count toward graduation

**SOC 511: Research Methodology for the Social Sciences**

(3-0) Cr. 3.

*Prereq: SOC 302 and STAT 401*

Covers the philosophy and the techniques of research methods in sociology and other social sciences, including the ethics and politics of social science, validity issues, conceptualization and operationalization, sampling strategies, appropriate research designs for different questions, survey construction, and various data collection and analysis techniques.

**SOC 512: Applied Multivariate Statistics for Social and Behavioral Research**

(3-0) Cr. 3.

*Prereq: STAT 404 or with instructor's permission*

Applied techniques of multivariate analysis including cluster analysis, principal components and factor analysis, multivariate analysis of variance and covariance binomial and multinomial regression, multi-level random coefficient models, and spatial regression. Conceptual and mathematical grounding for nonstatisticians. Instruction in Mplus and SAS.

**SOC 513: Qualitative Research Methods**

(3-0) Cr. 3.

*Prereq: SOC 511*

Applied qualitative research methods in sociology. Design and implementation of a course-based research project including data collection, analysis, and presentation of results. Qualitative data gathering techniques using observational, historical, in-depth interviewing or content analysis approaches. Laboratory emphasis on completion of data gathering, analysis, and report writing.



**SOC 520: Social Psychology: A Sociological Perspective**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

Examination of cognitive, symbolic interaction, exchange, role-reference group, and dramaturgical approaches. Assessment of contemporary issues in social psychology.

**SOC 525: Seminar in Social Psychology**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

**SOC 525A: Seminar in Social Psychology: Small Groups**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

**SOC 525B: Seminar in Social Psychology: Attitudes and Attitude Change**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

**SOC 525C: Seminar in Social Psychology: Symbolic interactionism**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

**SOC 525D: Seminar in Social Psychology: Self and Identity**

(3-0) Cr. 3.

*Prereq: SOC 305 or PSYCH 280*

**SOC 527: Seminar in Social Inequality**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Analysis of racial and ethnic inequality in the United States and the world; focus on the implications of the changing world social and economic order for differences in racial and ethnic groups relative to wealth, status, and power; a critical examination of majority-group domination of minority groups in various societies.

**SOC 527A: Seminar in Social Inequality: Sociology of Race and Ethnicity**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Analysis of racial and ethnic inequality in the United States and the world; focus on the implications of the changing world social and economic order for differences in racial and ethnic groups relative to wealth, status, and power; a critical examination of majority-group domination of minority groups in various societies.

**SOC 527B: Seminar in Social Inequality: Sociology of Gender**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Analysis of racial and ethnic inequality in the United States and the world; focus on the implications of the changing world social and economic order for differences in racial and ethnic groups relative to wealth, status, and power; a critical examination of majority-group domination of minority groups in various societies.

**SOC 533: Strategies for Rural Resiliency and Vitality**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Graduate standing or instructor permission.*

(Dual-listed with SOC 433). Experiential learning course on community resiliency and vulnerability. Focus on economic, social, cultural, environmental, and spatial dimensions of communities. Examine impacts of local strategies and state and national policies on community resiliency. Project-based work with communities and agencies. Applications using data discovery and survey research methods.

**SOC 534: Race, Class and Gender Inequality**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Critical examination of the causes and consequences of social stratification and inequality; classical theories, contemporary frameworks, and recent empirical studies; international stratification patterns.

**SOC 536: Strategies for Community Engagement in Food and Farming Systems**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Project-focused community practice using diverse approaches and perspectives.

**SOC 540: Comparative Social Change**

(3-0) Cr. 3.

*Prereq: 6 graduate credits in sociology*

Contemporary theories of social change, modernization, dependency, and development are critically examined; methodological issues identified; supporting research explored; applicability of theoretical models, concepts, and strategies to current national and international needs are evaluated.

**SOC 543: Seminar in Social Change and Development**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Seminar in social change and development.

**SOC 543A: Seminar in Social Change and Development: Strategies of Community Engagement**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

**SOC 543B: Seminar in Social Change and Development: Sociology of Adoption and Diffusion**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

**SOC 543C: Seminar in Social Change and Development: Technological Innovation, Social Change and Development**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

**SOC 544: Sociology of Food and Agricultural Systems**

(Dual-listed with SOC 444). (Cross-listed with SUSAG). (3-0) Cr. 3.

*Prereq: SOC 325 or graduate standing*

Social organization of food and fiber production, processing, and distribution systems. Sociological comparison of conventional and alternative production systems; gender roles in agriculture and food systems; local, national and global food systems; perspectives on food and agricultural research and policy.

**SOC 549: Sociology of the Environment**

(Cross-listed with SUSAG). (3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Social causes and social consequences of environmental problems. Interrelationship between social inequality and environmental inequality. Social construction and social experience of the environment. Contemporary developments in the social theory of the environment. International and domestic implications.

**SOC 550: Sociology of Economic Life**

(3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Social construction of economic activity in non-industrial and industrial societies with special attention on variations of industrial societies (capitalism and socialism), economic globalization, and economic development. Interaction of economic systems with human values, ideology, organizations, work and individual welfare.

**SOC 551: Seminar in Economy, Organization, and Work**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: 6 credits in sociology*

**SOC 551B: Seminar in Economy, Organization, and Work: Complex Organizations**

(3-0) Cr. 3. F.

*Prereq: 6 credits in sociology*

**SOC 584: Current Issues in Crime and Justice**

(Cross-listed with C J). (3-0) Cr. 3. Repeatable, maximum of 3 credits. Alt. F., offered odd-numbered years.

*Prereq: 6 credits in sociology*

Discussion of current research and theory in crime and delinquency; topics include the purpose and role of law in social life; emerging theoretical directions in criminology; recent work on specific forms of criminality; controversies in the criminal justice system.

**SOC 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: 6 credits in sociology; senior or graduate classification*

**SOC 590A: Special Topics: General Sociology**

Cr. 1-3. Repeatable.

*Prereq: 6 credits in sociology; senior or graduate classification*

**SOC 590B: Special Topics: Rural Sociology**

Cr. 1-3. Repeatable.

*Prereq: 6 credits in sociology; senior or graduate classification*

**SOC 591: Orientation to Sociology**

(1-0) Cr. 1. F.

*Prereq: Formal admission into the sociology graduate program*

Introduction to the department, current graduate student policies at department and university levels, departmental administrative procedures. Required of graduate students. Offered on a satisfactory-fail basis only.

**SOC 599: Creative Component**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

Research for Master's Thesis.

**SOC 599A: Research for Master's Thesis: General Sociology**

Cr. 1-6. Repeatable.

**SOC 599B: Research for Master's Thesis: Rural Sociology**

Cr. 1-6. Repeatable.

**Courses for graduate students:**

**SOC 607: Contemporary Sociological Theory**

(3-0) Cr. 3.

*Prereq: 6 graduate credits in sociology*

Provides a review of modern sociological thought, issues, and controversies as they affect current research and discourse in the discipline.

**SOC 610: Foundations of Sustainable Agriculture**

(Cross-listed with A B E, AGRON, ANTHR, SUSAG). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**SOC 613: Structural Equation Models for Social and Behavioral Research**  
(3-0) Cr. 3.*Prereq: SOC 512 and STAT 404, or with instructors permission.*

Specification, identification, and interpretation of structural equation models. Techniques include structural or path models, measurement or confirmatory factor models, structural models with latent variables, and multi-level structural models. Conceptual and mathematical grounding for non-statisticians. Instruction in AMOS, MPLUS, and SAS.

**SOC 698: Seminars in Sociology**

(3-0) Cr. 3.

**SOC 698L: Seminars in Sociology: Community Studies and Development**  
(3-0) Cr. 3.**SOC 698M: Seminars in Sociology: Criminology**  
(3-0) Cr. 3.**SOC 698N: Seminars in Sociology: The Economy, Organizations, and Work**  
(3-0) Cr. 3.**SOC 698O: Seminars in Sociology: Food Systems, Agriculture, and the Environment**  
(3-0) Cr. 3.**SOC 698P: Seminars in Sociology: Methodology**  
(3-0) Cr. 3.**SOC 698Q: Seminars in Sociology: Social Change and Development**  
(3-0) Cr. 3.**SOC 698R: Seminars in Sociology: Social Inequality**  
(3-0) Cr. 3.**SOC 698S: Seminars in Sociology: Social Psychology**  
(3-0) Cr. 3.**SOC 698T: Seminars in Sociology: Sociology of Families**  
(3-0) Cr. 3.**SOC 698U: Seminars in Sociology: Theory**  
(3-0) Cr. 3.**SOC 699: Research**

Cr. 1-8. Repeatable, maximum of 8 credits.

**SOC 699A: Dissertation Research: General Sociology**  
Cr. 1-8. Repeatable.**SOC 699B: Dissertation Research: Rural Sociology**

Cr. 1-8. Repeatable.

## Software Engineering (S E)

***Any experimental courses offered by S E can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:****S E 101: Software Engineering Orientation**

Cr. R.

Introduction to the procedures, policies, and resources of Iowa State University and the Software Engineering Program. Offered on a satisfactory-fail basis only.

**S E 166: Careers in Software Engineering**

Cr. R.

Overview of the nature and scope of the software engineering profession, relationship of coursework to careers, and program of study planning. Offered on a satisfactory-fail basis only.

**S E 185: Problem Solving in Software Engineering**

(2-2) Cr. 3.

*Prereq: Credit or concurrent enrollment in MATH 143 (or satisfactory scores on mathematics placement examinations)*

Introduction to software engineering and computer programming. Systematic thinking process for problem solving in the context of software engineering. Group problem solving. Solving software engineering problems and presenting solutions through computer programs, written documents and oral presentations. Introduction to principles of programming, software design, and extensive practice in design, writing, running, debugging, and reasoning about programs. Satisfactory placement scores can be found at: <https://math.iastate.edu/academics/undergraduate/aleks/placement/>. Only one of ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, and S E 185 may count toward graduation.

**S E 186: Problem Solving in Software Engineering II**

(0-2) Cr. 1. S.

*Prereq: S E 185*

Group projects in software engineering. Work effectively in teams to solve problems and provide technical reports and presentations. Self-directed team based projects that are representative of problems faced by software engineers.

**S E 309: Software Development Practices**

(Cross-listed with COM S). (3-1) Cr. 3. F.S.

*Prereq: Minimum of C- in (COM S 228; MATH 165)*

Practical introduction to methods for managing software development. Software engineering concepts, practices and tools. Requirements analysis, structured and object-oriented design, coding, testing, and maintenance. Software process models, software tools and environments. Programming projects that provide exposure to information management techniques, client/server model, networking and communication.

**S E 317: Introduction to Software Testing**

Cr. 3.

*Prereq: (COM S 230 or CPR E 310); (COM S 309 or S E 309)*

Basic principles and techniques for software testing. Test requirements and management. Test design techniques, evaluation metrics, model-based testing, unit testing, system and integration testing. Software testing tools and programming projects.

**S E 319: Construction of User Interfaces**

(Cross-listed with COM S). (3-0) Cr. 3. F.S.

*Prereq: COM S 228*

Overview of user interface design. Evaluation and testing of user interfaces. Review of principles of object orientation, object oriented design and analysis using UML in the context of user interface design. Design of windows, menus and commands. Developing Web and Windows-based user-interfaces. Event-driven programming. Introduction to Frameworks and APIs for the construction of user interfaces.

**S E 329: Software Project Management**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: COM S 309*

Process-based software development. Capability Maturity Model (CMM). Project planning, cost estimation, and scheduling. Project management tools. Factors influencing productivity and success. Productivity metrics. Analysis of options and risks. Version control and configuration management. Inspections and reviews. Managing the testing process. Software quality metrics. Modern software engineering techniques and practices.

**S E 339: Software Architecture and Design**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq: S E 319*

Modeling and design of software at the architectural level. Architectural styles. Basics of model-driven architecture. Object-oriented design and analysis. Iterative development and unified process. Design patterns. Design by contract. Component based design. Product families. Measurement theory and appropriate use of metrics in design. Designing for qualities such as performance, safety, security, reliability, reusability, etc. Analysis and evaluation of software architectures. Introduction to architecture definition languages. Basics of software evolution, reengineering, and reverse engineering. Case studies. Introduction to distributed system software.

**S E 342: Principles of Programming Languages**

(Cross-listed with COM S). (3-1) Cr. 3. F.S.

*Prereq: Minimum of C- in COM S 228 and MATH 165; COM S 230 or CPR E 310*

Study of concepts in programming languages, especially functional programming concepts. Overview of major programming paradigms, their relationship, and tradeoffs among paradigms enabling sound choices of programming language for application-specific development. Programming projects.

**S E 362: Object-Oriented Analysis and Design**

(Cross-listed with COM S). (3-0) Cr. 3. F.S.

*Prereq: Minimum of C- in (COM S 228; MATH 165); ENGL 250*

Object-oriented requirements analysis and systems design. Analysis and design methodologies including use case and Unified Modeling Language (UML). Design principles, heuristics, and patterns. Architectural patterns and alternative programming paradigms. Group design and programming project.

**S E 409: Software Requirements Engineering**

(Dual-listed with COM S 509). (3-0) Cr. 3.

*Prereq: COM S 309; for graduate credit: graduate standing or permission of instructor*

The requirements engineering process including elicitation, requirements analysis fundamentals, requirements specification and communication, and requirements evaluation. Modeling of functional and nonfunctional requirements, traceability, and requirements change management. Case studies and software projects.

**S E 412: Formal Methods in Software Engineering**

(Dual-listed with COM S 512). (Cross-listed with COM S, CPR E). (3-0) Cr. 3.

*Prereq:* COM S 311; STAT 305 or STAT 330 or STAT 341; for graduate credit: graduate standing or permission of instructor

A study of formal techniques for model-based specification and verification of software systems. Topics include logics, formalisms, graph theory, numerical computations, algorithms and tools for automatic analysis of systems. Graduate credit requires in-depth study of concepts.

**S E 413: Program Analysis**

(Dual-listed with COM S 513). (Cross-listed with COM S). (3-0) Cr. 3.

*Prereq:* (COM S 327 or CPR E 288); COM S 342

Algorithms, AI techniques and tools for automatically reasoning about code and program executions. Theory and foundations related to control flow analysis, dataflow analysis, abstract interpretation, and symbolic execution. Applications of program analysis to bug detection, test input generation, debugging, program repair, specification inference and trustworthy AI engineering. Concepts, algorithms, tools, benchmarks, methodologies for solving problems using program analysis and for preparing research in program analysis.

**S E 416: Software Evolution and Maintenance**

(Cross-listed with CPR E). (3-0) Cr. 3.

*Prereq:* COM S 309

Practical importance of software evolution and maintenance, systematic defect analysis and debugging techniques, tracing and understanding large software, impact analysis, program migration and transformation, refactoring, tools for software evolution and maintenance, experimental studies and quantitative measurements of software evolution. Written reports and oral presentation.

**S E 417: Software Testing**

(Cross-listed with COM S). (3-0) Cr. 3.

*Prereq:* COM S 309; (COM S 230 or CPR E 310); ENGL 250

An introduction to software testing principles and techniques. Test models, test design, test adequacy criteria; regression, integration, and system testing; and software testing tools.

**S E 419: Software Tools for Large Scale Data Analysis**

(Cross-listed with CPR E). (3-3) Cr. 4.

*Prereq:* COM S 363 or COM S 352 or CPR E 308; COM S 228

Software tools for managing and manipulating large volumes of data, external memory processing, large scale parallelism, and stream processing, data interchange formats. Weekly programming labs that involve the use of a parallel computing cluster.

**S E 421: Software Analysis and Verification for Safety and Security**

(Cross-listed with CPR E). Cr. 3. F.S.

*Prereq:* (COM S 230 or CPR E 310); COM S 309

Significance of software safety and security; various facets of security in cyber-physical and computer systems; threat modeling for software safety and security; and categorization of software vulnerabilities. Software analysis and verification: mathematical foundations, data structures and algorithms, program comprehension, analysis, and verification tools; automated vs. human-on-the-loop approach to analysis and verification; and practical considerations of efficiency, accuracy, robustness, and scalability of analysis and verification. Cases studies with application and systems software; evolving landscape of software security threats and mitigation techniques. Understanding large software, implementing software analysis and verification algorithms.

**S E 422: Cloud Computing - Software Development**

(3-0) Cr. 3. F.

*Prereq:* (S E 309 or S E 339); (CPR E 381 or COM S 321)

A comprehensive view of cloud computing with respect to software development from platforms and services to programming and infrastructure. Virtualization and containerization; cloud computing platforms, with examples from currently available cloud services; cloud services for data analytics, machine learning, and devops; programming frameworks for parallel computing in the cloud; distributed storage in the cloud; Container management. Includes homeworks and programming assignments. The programming assignments will be done in AWS.

**S E 440: Principles and Practice of Compiling**

(Dual-listed with COM S 540). (Cross-listed with COM S). (3-1) Cr. 3.

*Prereq:* COM S 331 or COM S 342; COM S 309; ENGL 250; for graduate credit: graduate standing or permission of instructor

Theory of compiling and implementation issues of programming languages. Programming projects leading to the construction of a compiler. Projects with different difficulty levels will be given for 440 and 540. Topics include: lexical, syntactic and semantic analyses, syntax-directed translation, code generation, runtime environment and library support.

**S E 490: Independent Study**

Cr. arr. Repeatable.

*Prereq:* Senior classification in software engineering; Permission of Instructor  
Investigation of an approved topic.

**S E 491: Senior Design Project I and Professionalism**

(Cross-listed with CPR E, E E). (2-3) Cr. 3. F.S.

*Prereq: CPR E major: CPR E 232, cr or enrollment in CPR E 308, completion of 29 cr in the CPRE prof prog, ENGL 314. E E major: E E 232, cr or enrollment in E E 322, completion of 24 cr in the EE prof prog, ENGL 314. S E major: S E 317 and S E 339, ENGL 309 or ENGL 314. Co-req: CPR E 308 or COM S 352*

Preparing for entry to the workplace. Selected professional topics. Use of technical writing skills in developing project plan and design report; design review presentation. First of two-semester team-oriented, project design and implementation experience.

**S E 492: Senior Design Project II**

(Cross-listed with CPR E, E E). (1-3) Cr. 2. F.S.

*Prereq: CPR E 491 or E E 491 or S E 491*

Second semester of a team design project experience. Emphasis on the successful implementation and demonstration of the design completed in E E 491, Cpr E 491, or S E 491 and the evaluation of project results.

Technical writing of final project report; oral presentation of project achievements; project poster.

## Spanish (SPAN)

***Any experimental courses offered by SPAN can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

**SPAN 097: Accelerated Spanish Review**

(3-2) Cr. 0. F.S.

For students who require additional review at the first year (101-102) level. Course components include a compact review of 101 and the essential elements of 102. Course completed with a passing grade fulfills the LAS foreign language requirement. Not recommended for students who wish to continue language at the second year (201-202) level without completing 102. Two years but less than three years of high-school Spanish recommended.

**SPAN 101: Elementary Spanish I**

(4-0) Cr. 4. F.SS.

A communicative approach to grammar and vocabulary within the context of Hispanic culture. For students whose native language is not Spanish.

**SPAN 102: Elementary Spanish II**

(4-0) Cr. 4. S.SS.

*Prereq: SPAN 101 or SPAN 97 or placement by departmental exam*

Continuation of Spanish 101. A communicative approach to grammar and vocabulary within the context of Hispanic culture. For students whose native language is not Spanish.

Meets International Perspectives Requirement.

**SPAN 195: Study Abroad**

Cr. 3. SS.

Supervised instruction in Spanish and Hispanic culture; formal class instruction at level appropriate to student's training, augmented by practical living experience. Taught in Spanish. Consult the department regarding equivalency with SPAN 101 or 102.

Meets International Perspectives Requirement.

**SPAN 201: Intermediate Spanish I**

(4-0) Cr. 4. F.

*Prereq: SPAN 102 or placement by departmental exam*

Intensive review of basic grammar and conversation. For students whose native language is not Spanish. Practice in oral and written communication. Development of fluency with idiomatic expressions. Selected readings on culture and literature.

Meets International Perspectives Requirement.

**SPAN 202: Intermediate Spanish II**

(4-0) Cr. 4. S.

*Prereq: SPAN 201 or placement by departmental exam*

Continuation of Spanish 201. Intensive review of basic grammar. Practice in oral and written communication. Development of fluency with idiomatic expressions. Selected readings on culture and literature. For students whose native language is not Spanish.

Meets International Perspectives Requirement.

**SPAN 295: Study Abroad**

Cr. 3. SS.

*Prereq: SPAN 102*

Supervised instruction in Spanish and Hispanic culture; formal class instruction at level appropriate to student's training, augmented by practical living experience. Taught in Spanish. Consult the department regarding equivalency with Span 201 or 202.

Meets International Perspectives Requirement.

**SPAN 297: Intensive Intermediate Spanish**

(4-0) Cr. 4. F.S.

*Prereq: SPAN 201 or placement by departmental exam*

Bridge course between 200- and 300-level Spanish courses that focuses on application of advanced grammatical concepts within the context of Hispanic culture. Accelerated review of SPAN 201 and SPAN 202 designed for students who want to continue at the 300 level. Taught in Spanish for students whose native language is not Spanish.

Meets International Perspectives Requirement.



**SPAN 302: Mini-Modules for Global Professionals**

Cr. 1. Repeatable, maximum of 9 credits. F.S.

*Prereq: SPAN 202 or SPAN 297 or placement by departmental exam*

Introduction to professional communication within specific professional cultures with strong preparation of relevant vocabulary related to professional fields in which high degrees of Spanish are spoken. Taught in Spanish. Each topic may only be taken once for credit.

Meets International Perspectives Requirement.

**SPAN 302A: Mini-Modules for Global Professionals: Tourism and Hospitality**

Cr. 1. F.S.

*Prereq: SPAN 202 or SPAN 297 or placement by departmental exam*

Introduction to professional communication within specific professional cultures with strong preparation of relevant vocabulary related to professional fields in which high degrees of Spanish are spoken. Taught in Spanish. Each topic may only be taken once for credit.

Meets International Perspectives Requirement.

**SPAN 302B: Mini-Modules for Global Professionals: Health and Medicine**

Cr. 1. F.S.

*Prereq: SPAN 202 or SPAN 297 or placement by departmental exam*

Introduction to professional communication within specific professional cultures with strong preparation of relevant vocabulary related to professional fields in which high degrees of Spanish are spoken. Taught in Spanish. Each topic may only be taken once for credit.

Meets International Perspectives Requirement.

**SPAN 302C: Mini-Modules for Global Professionals: Criminal Justice and the Law**

Cr. 1. F.S.

*Prereq: SPAN 202 or SPAN 297 or placement by departmental exam*

Introduction to professional communication within specific professional cultures with strong preparation of relevant vocabulary related to professional fields in which high degrees of Spanish are spoken. Taught in Spanish. Each topic may only be taken once for credit.

Meets International Perspectives Requirement.

**SPAN 303: Spanish Conversation and Composition**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 202 or placement by departmental exam*

Intensive oral practice and improvement of oral proficiency. Application of specific grammatical concepts for development of conversational and writing skills within the context of Hispanic culture. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 303A: Spanish Conversation and Composition: through Culture**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 202 or placement by departmental exam*

Intensive oral practice and improvement of oral proficiency. Application of specific grammatical concepts for development of conversational and writing skills within the context of Hispanic culture. Taught in Spanish.

For students whose native language is not Spanish.

Meets International Perspectives Requirement.

**SPAN 303B: Spanish Conversation and Composition: for Professionals**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 202 or placement by departmental exam*

Intensive oral practice and improvement of oral proficiency. Application of specific grammatical concepts for development of conversational and writing skills within the context of Hispanic culture. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 304: Spanish for Global Professionals**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 202 or placement by departmental exam*

Introduction to professional vocabulary and communication within cultural contexts of the Spanish-speaking world. Taught in Spanish. SPAN 303B recommended.

Meets International Perspectives Requirement.

**SPAN 305: Spanish for Heritage Speakers**

(Cross-listed with US LS). (3-0) Cr. 3. S.

*Prereq: Permission of Instructor*

Intensive study and application of grammar concepts in the development of writing and reading skills in a dynamic cultural context centered on Hispanics in the U.S. Designed for native or heritage Spanish speakers with oral proficiency in Spanish but with little or no formal academic training in the language. Taught exclusively in Spanish.

Meets U.S. Diversity Requirement

**SPAN 314: Textual and Media Analyses**

(3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or 303B*

Critical reading of Hispanic cultural texts. Presentation of techniques and terminology of textual criticism. Study of basic genres and media-generated artifacts and literary texts. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 321: Spanish Civilization**

(3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

A survey of the social, political, religious, and cultural history of Spain. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 322: Latin American Civilization**

(3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

A survey of the social, political, religious, and cultural history of Spanish America. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 323: Spain Today**

(3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

A survey of social, political, economic, and cultural topics relevant to contemporary Spain. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 324: Latin America Today**

(3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

A survey of social, political, economic, and cultural topics relevant to contemporary Latin America. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 325: Culture and Community: Iowa and Midwest Latino/as**

(Cross-listed with US LS). (3-0) Cr. 3. S.

*Prereq: US LS 211*

Analysis and discussion of interdisciplinary texts examining the local and regional Latino/a immigration experience. Exploring Latino/a culture through participation in a community project. Assessed service learning component.

**SPAN 326: Studies in Hispanic Art or Film**

(Dual-listed with SPAN 526). (3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

Survey of major currents and figures in Spanish and Latin American art and/or film. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 330: Studies in Spanish Literature**

(3-0) Cr. 3.

*Prereq: SPAN 314*

Introduction to Spanish literature and techniques of literary criticism from the earliest times through the present. Lectures, discussion, and analysis of individual selections in Spanish. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 332: Studies in Latin American Literature**

(3-0) Cr. 3.

*Prereq: SPAN 314*

Introduction to Latin American literature and techniques of literary criticism from the earliest times through the present. Lectures, discussion, and analysis of individual selections in Spanish. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 351: Introduction to Spanish-English Translation**

(Cross-listed with LING, US LS). (3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or SPAN 303B or SPAN 304*

Introduction to the theory, methods, techniques, and problems of translation. Consideration of material from business, literature, and the social sciences. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 352: Spanish Pronunciation**

(Cross-listed with LING). (3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or SPAN 303B or SPAN 304*

An introductory study of the articulation, classification, distribution, and regional variations of the sounds of the Spanish language. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 354: Introduction to Spanish-English Interpretation**

(Dual-listed with SPAN 554). (Cross-listed with LING). (3-0) Cr. 3. F.S.

*Prereq: SPAN 351*

Introduction to the theory, methods, techniques, and problems of consecutive and simultaneous interpretation. Consideration of material from business, agriculture, law, design, medicine, literature, advertisement, and sports. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 370: Hispanic Topics in English Translation**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. May not be counted as a prerequisite.

Meets International Perspectives Requirement.

**SPAN 370A: Hispanic Topics in English Translation: Agriculture**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

Topics vary according to faculty interest. Knowledge and understanding of major cultural, ethical, sociopolitical and economic issues directly related to agriculture and agribusiness in Latin America, Spain, and/or Equatorial Guinea. Readings, discussions, and papers in English. May not be counted as a prerequisite.

**SPAN 370S: Studies in English Translation: Hispanic Topics on Women or Feminism**

(Cross-listed with WGS). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. May not be counted as a prerequisite.

Meets International Perspectives Requirement.

**SPAN 378: Hispanic Film Studies in English**

(3-0) Cr. 3. F.S.SS.

Analysis and interpretation of cinema in the Spanish-speaking world.

Topics vary and may include, but are not limited to, film directors, genres, movements, historical survey, aesthetics, and cinematography. Readings, discussions, and papers in English. Does not count towards Spanish major or minor requirements.

Meets International Perspectives Requirement.

**SPAN 395: Study Abroad**

Cr. 1-10. Repeatable.

*Prereq: 12 credits in SPAN*

Supervised instruction in Spanish and Hispanic culture; formal class instruction at level appropriate to students' training, enhanced by practical living experience.

Meets International Perspectives Requirement.

**SPAN 401: Advanced Composition and Grammar**

(Dual-listed with SPAN 501). (3-0) Cr. 3. F.

*Prereq: SPAN 314; 1 SPAN course at the 320-level or above*

Advanced study of Spanish grammar and syntax. Students' writing of compositions incorporates an advanced understanding of grammar, syntax, and principles of organization of thought and ideas. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 440: Seminar on the Literatures and Cultures of Spain**

(Dual-listed with SPAN 540). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 332*

Discussion and analysis of selected topics in Spanish literature and culture from the Middle Ages to the Present. Taught in Spanish. SPAN 330 recommended.

Meets International Perspectives Requirement.

**SPAN 441: Seminar on Cervantes and the Golden Age**

(Dual-listed with SPAN 541). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 332*

Discussion and analysis of selected works of Cervantes within the social and cultural context of the Golden Age. Taught in Spanish. SPAN 330 recommended.

Meets International Perspectives Requirement.

**SPAN 445: Seminar on the Literatures and Cultures of Latin America**

(Dual-listed with SPAN 545). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 330*

Discussion and analysis of selected topics in Latin American literature and culture from Pre-Colonial times to the Present. Taught in Spanish. SPAN 332 recommended.

Meets International Perspectives Requirement.

**SPAN 462: Contrastive Analysis of Spanish/ English for Translators**

(Cross-listed with LING). (3-0) Cr. 3.

*Prereq: SPAN 351*

Linguistic study of the major differences between the Spanish and English grammatical systems and their applications in the translation of Spanish to English. Taught in Spanish.

**SPAN 463: Contemporary Spanish Linguistics**

(Dual-listed with SPAN 563). (Cross-listed with LING). (3-0) Cr. 3.

Repeatable, maximum of 6 credits.

*Prereq: SPAN 352*

Study of various topics related to the Spanish language. Topics may include bilingualism, historical linguistics and dialectology, Spanish in the U.S., language assessment, computer-assisted language learning and instruction, and second language acquisition. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 490: Independent Study**

Cr. 1-6. Repeatable, maximum of 6 credits.

*Prereq: 6 credits in SPAN; Permission of Department Chair*

Designed to meet the needs of students in areas other than those in which courses are offered, or who desire to integrate a study of literature or language with special problems in major fields. No more than 6 credits in Span 490 may be counted toward graduation.

**SPAN 499: Internship in Spanish**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in SPAN at the 300-level; Permission of Advisor and WLC Internship Coordinator*

Work experience using Spanish language skills in the public or private sector, combined with academic work under faculty supervision. Up to 3 credits may apply toward the major. Available only to majors and minors.

**Courses primarily for graduate students, open to qualified undergraduates:**

**SPAN 501: Advanced Composition and Grammar**

(Dual-listed with SPAN 401). (3-0) Cr. 3. F.

*Prereq: SPAN 314; 1 SPAN course at the 320-level or above*

Advanced study of Spanish grammar and syntax. Students' writing of compositions incorporates an advanced understanding of grammar, syntax, and principles of organization of thought and ideas. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 526: Studies in Hispanic Art or Film**

(Dual-listed with SPAN 326). (3-0) Cr. 3.

*Prereq: 1 SPAN course at the 300-level*

Survey of major currents and figures in Spanish and Latin American art and/or film. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 540: Seminar on the Literatures and Cultures of Spain**

(Dual-listed with SPAN 440). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 332*

Discussion and analysis of selected topics in Spanish literature and culture from the Middle Ages to the Present. Taught in Spanish. SPAN 330 recommended.

Meets International Perspectives Requirement.

**SPAN 541: Seminar on Cervantes and the Golden Age**

(Dual-listed with SPAN 441). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 332*

Discussion and analysis of selected works of Cervantes within the social and cultural context of the Golden Age. Taught in Spanish. SPAN 330 recommended.

Meets International Perspectives Requirement.

**SPAN 545: Seminar on the Literatures and Cultures of Latin America**

(Dual-listed with SPAN 445). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: SPAN 330*

Discussion and analysis of selected topics in Latin American literature and culture from Pre-Colonial times to the Present. Taught in Spanish. SPAN 332 recommended.

Meets International Perspectives Requirement.

**SPAN 554: Introduction to Spanish-English Interpretation**

(Dual-listed with SPAN 354). (Cross-listed with LING). (3-0) Cr. 3. F.S.

*Prereq: SPAN 351*

Introduction to the theory, methods, techniques, and problems of consecutive and simultaneous interpretation. Consideration of material from business, agriculture, law, design, medicine, literature, advertisement, and sports. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 563: Contemporary Spanish Linguistics**

(Dual-listed with SPAN 463). (Cross-listed with LING). (3-0) Cr. 3.

Repeatable, maximum of 6 credits.

*Prereq: SPAN 352*

Study of various topics related to the Spanish language. Topics may include bilingualism, historical linguistics and dialectology, Spanish in the U.S., language assessment, computer-assisted language learning and instruction, and second language acquisition. Taught in Spanish.

Meets International Perspectives Requirement.

**SPAN 590: Special Topics in Spanish**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Spanish*

**SPAN 590A: Special Topics in Spanish: Literature or Literary Criticism**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Spanish*

**SPAN 590B: Special Topics in Spanish: Linguistics**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Spanish*

**SPAN 590C: Special Topics in Spanish: Language Pedagogy**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Spanish*

**SPAN 590D: Special Topics in Spanish: Civilization**

Cr. 1-4. Repeatable.

*Prereq: Permission of instructor; 6 credits of 400 level Spanish*

## Special Education (SP ED)

**Any experimental courses offered by SP ED can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**SP ED 250: Education of the Exceptional Learner**

(3-0) Cr. 3. F.S.

*Prereq: EDUC 205*

An overview of students with diverse learning needs, including students with disabilities, English Learners, students who are at risk, and gifted learners. Emphasis is on early identification; educational programming and implications; and legal foundations. Includes Individual Education Programs, Least Restrictive Environment, Functional Behavioral Assessment, and Behavior Intervention Plans.

**SP ED 330: Introduction to Instruction for Students with Mild/Moderate Disabilities**

(3-0) Cr. 3. F.

*Prereq: SP ED 250 and EDUC 280I, Concurrent enrollment in EDUC 377; Admitted to the Educator Preparation Program.*

Educational services and programming for students with mild/moderate disabilities examined from an historical perspective. Current trends, issues, impact of federal and state laws, and identification procedures. Characteristics of students with mild/moderate disabilities.

**SP ED 334: Teaching Exceptional Learners in the General Classroom**

(3-0) Cr. 3. F.

*Prereq: Admitted to Educator Preparation Program; Concurrent enrollment in SP ED 330*

Evidence-based strategies for inclusive education. Emphasis on principles of behavior, classroom management, differentiation, and accommodations.

**SP ED 365: Classroom Assessment for Special Education**

(3-0) Cr. 3. S.

*Prereq: Admitted to Educator Preparation Program; SP ED 330; EDUC 377*  
Formal and informal academic and behavioral assessment. Determination of special education needs. Planning, adaptation, and formative evaluation of instructional programs for students with mild/moderate disabilities.

**SP ED 401: Teaching Secondary Students with Exceptionalities in General Education**

(3-0) Cr. 3. F.S.

*Prereq: Admitted to Educator Preparation Program.*

Characteristics and needs of youth with exceptionalities, including appropriate service delivery options. Emphasis on legal foundations, co-teaching models, differentiated instruction, accommodations for instruction and assessment, strategies to address challenging behaviors, and collaboration among professionals and families. Includes Individual Education Programs, Least Restrictive Environment, Functional Behavioral Assessment, and Behavior Intervention Plans.

**SP ED 405: Assessment and Instructional Methods in Inclusive Primary Settings (K-3)**

(4-0) Cr. 4. F.S.

*Prereq: SP ED 250 (or equivalent), EDUC 377, EDUC 438; admitted to the Educator Preparation Program; concurrent enrollment in SP ED 458, EDUC 433, EDUC 439, EDUC 468I.*

Examination and application of strategies to determine special educational needs, planning and evaluating instructional programs, and monitoring student progress. Evidence-based instructional strategies in academic and social areas that support learning of students with diverse learning needs. Emphasis on accommodations and alternative teaching strategies to meet individual student needs.

**SP ED 416: Supervised Student Teaching**

Cr. arr. F.S.

*Prereq: Admitted to Educator Preparation Program, senior classification, elementary education major; SP ED 330, SP ED 334, SP ED 365, SP ED 436, SP ED 439, EDUC 280I, EDUC 452*  
Reservation required.

**SP ED 436: Instructional Methods for Students with Mild/Moderate Disabilities**

(3-0) Cr. 3. S.

*Prereq: Admitted to Educator Preparation Program: EDUC 245, concurrent enrollment in SP ED 365*

Evidence-based instructional strategies in academic areas, as well as class, group, and individual behavior management for elementary students with mild/moderate disabilities.

**SP ED 458: Pre-Student Teaching Experience III: Mild/Moderate Disabilities in Primary Grades (K-3)**

(0-2) Cr. 1. F.S.

*Prereq: EDUC 377, EDUC 438; Admitted to Educator Preparation Program*  
Observation and involvement with students with mild/moderate disabilities in the primary grades (K-3). Concurrent enrollment in SP ED 405. Half a day of time needed. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**SP ED 459: Pre-Student Teaching Experience III: Mild/Moderate Disabilities**

(0-2) Cr. 1. F.

*Prereq: SP ED 330, SP ED 334, SP ED 365, SP ED 436; Admitted to Educator Preparation Program*  
Observation and involvement with students with mild/moderate disabilities in school settings. Concurrent enrollment in Sp Ed 460. 1/2 day of time needed. Clinical Experience Level 3. Offered on a satisfactory-fail basis only.

**SP ED 460: Special Education Seminar**

(1-0) Cr. 1. F.

*Prereq: SP ED 436, concurrent enrollment in SP ED 459*

Application of evidence-based instructional strategies/techniques in academic and behavioral areas with students who have mild/moderate disabilities. Discussion of professional practices.

**SP ED 464: Collaborative Partnerships in Special Education**

(3-0) Cr. 3. F.

*Prereq: SP ED 365, SP ED 436*

Collaborative skills used in education of students with mild/moderate disabilities. Includes collaboration between general and special education teachers, families, para-educators, and other education professionals and agencies. Development of Individual Education Programs for students with mild/moderate disabilities.

**SP ED 490: Independent Study**

Cr. 1-5. Repeatable. F.S.

*Prereq: 12 credits in Elementary Education*

Topics vary.

**Courses primarily for graduate students, open to qualified undergraduates:**

**SP ED 501: Teaching Secondary Students with Exceptionalities in General Education**

(3-0) Cr. 3. SS.

*Prereq: Admitted to Educator Preparation Program; Baccalaureate degree*

Characteristics and needs of exceptional children/youth, including appropriate service delivery options. Emphasis on legal foundations, co-teaching models, differentiated instruction, accommodations for instruction and assessment, and collaboration among professionals and parents. Includes Individual Education Programs, Least Restrictive Environment, Functional Behavioral Assessment, and Behavior Intervention Plans.

**SP ED 510: Foundations in Mild/Moderate Disabilities**

(3-0) Cr. 3. S.

*Prereq: SP ED 501 or equivalent*

Historical and legal foundations for special education. Characteristics, prevalence, and etiology of mild/moderate disabilities. Historical and contemporary models of programming for students with disabilities.

**SP ED 511: Foundations of Behavior Disorders and Learning Disabilities**

(3-0) Cr. 3. S.

*Prereq: Sp Ed 501 or equivalent*

Theory, characteristics, and special education service delivery models to students with moderate/severe behavior/learning disabilities in the public schools and residential settings.

**SP ED 515: Assessment of Children and Youth with Disabilities**

(3-0) Cr. 3. F.

*Prereq: SP ED 510 or SP ED 511*

Formal and informal methods of assessment for identification/eligibility and progress monitoring. Formative evaluation of academic and behavioral skills, including curriculum-based measurement and functional behavioral assessment.

**SP ED 517: Research Review**

(2-0) Cr. 2. SS.

*Prereq: RESEV 550, SP ED 515*

Critical review of recent research in education and related behavioral sciences as applied to education of students with disabilities. Examination of multiple research methodologies.

**SP ED 520: Evidence-based Practices for Mild/Moderate Disabilities**

(3-0) Cr. 3.

*Prereq: SP ED 510, SP ED 515*

Evidence-based strategies for meeting the academic and behavioral needs of students with mild/moderate disabilities, including instructional and behavior management strategies appropriate for students with mild or moderate disabilities.

**SP ED 530: Evidence-based Practices in Behavior Disorders**

(3-0) Cr. 3. S.

*Prereq: SP ED 511, SP ED 515*

Current research on evidence-based interventions designed to improve the behavior and social skills of students with moderate/severe behavior disorders. Particular emphasis on positive behavioral supports and behavior change strategies.

**SP ED 540: Evidence-based Practices in Learning Disabilities**

(3-0) Cr. 3. S.

*Prereq: SP ED 511, SP ED 515*

Current research on evidence-based interventions designed to improve the academic performance of students with moderate/severe learning disabilities. Particular emphasis on methods for improving reading, written expression, and mathematics, as well as performance in content-area instruction.

**SP ED 553: Teaching Adolescents who Struggle with Reading**

(Cross-listed with EDUC). (3-0) Cr. 3. F.S.

*Prereq: Teaching license or senior status*

Instructional strategies for enhancing the fluency, vocabulary and comprehension of adolescents with reading difficulties. Attention to content-area reading materials and strategies.



**SP ED 555: Career Education and Transition for Youth with Disabilities**  
(3-0) Cr. 3. SS.

*Prereq: SP ED 510 or SP ED 511*

Examination of the academic, personal, social, employability, and daily living skills. Exploration of assessments, curricula, programs, and services to meet these needs.

**SP ED 560: Classroom Management/Behavior Support**  
(3-0) Cr. 3. F.

*Prereq: Teaching license*

Emphasis on positive behavioral supports and understanding behavior and its context through a functional behavioral approach. Design and development of carefully planned behavioral intervention programs for groups and individual students in general and special education settings.

**SP ED 564: Collaborative Consultation**  
(3-0) Cr. 3. F.

*Prereq: SP ED 515, SP ED 520 or SP ED 530 or SP ED 540*

Characteristics and methods to promote effective collaboration and/or consultation with families, paraprofessionals, other school personnel, and representatives of other agencies. Role of consultants/collaborators in various settings. Includes specific attention to IEP development as a collaborative process.

**SP ED 567: Teaching Secondary Learners with Mathematics Difficulties**  
(Cross-listed with EDUC). (3-0) Cr. 3.

*Prereq: Secondary teaching experience*

Instructional methods and assessment techniques for secondary students struggling to learn mathematics. Particular emphasis on current research, practices, and trends in mathematics interventions for at-risk students and students with disabilities.

**SP ED 570: Systems-level Supports for Youth with Behavior and Learning Disabilities**  
(3-0) Cr. 3. SS.

*Prereq: SP ED 511*

Overview of support systems (education, juvenile justice, mental health, communities) that serve students with special education needs. Identify resources to work with and support families.

**SP ED 590: Special Topics**  
Cr. 1-5. F.S.

*Prereq: 6 credits in Education*

Topics vary.

**SP ED 591: Supervised Field Experience**  
(0-2) Cr. 1-6. F.S.

*Prereq: 15 graduate credits in special area, admission to the graduate program in special education*

Supervised on-the-job field experience in special areas.

**SP ED 591G: Supervised Field Experience: Mild/Moderate Disabilities, K-8**

(0-2) Cr. 1-6. F.S.

*Prereq: 15 graduate credits in special area, admission to the graduate program in special education*

Supervised on-the-job field experience in special areas.

**SP ED 591H: Supervised Field Experience: Mild/Moderate Disabilities, 5-12**

(0-2) Cr. 1-6. F.S.

*Prereq: 15 graduate credits in special area, admission to the graduate program in special education*

Supervised on-the-job field experience in special areas.

**SP ED 591K: Supervised Field Experience: Behavior Disorders/Learning Disabilities, Ages 5-21**

(0-2) Cr. 1-6. F.S.

*Prereq: 15 graduate credits in special area, admission to the graduate program in special education*

Supervised on-the-job field experience in special areas.

**SP ED 591L: Supervised Field Experience: Special Education, Non-licensure**

Cr. 1-6. F.S.

*Prereq: 15 graduate credits in special area, admission to the graduate program in special education*

Supervised on-the-job field experience in special areas.

**SP ED 599: Creative Component**

Cr. 1-5. F.S.SS.

*Prereq: 15 credits in education*

**Courses for graduate students:**

**SP ED 615: Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits.

Selected topics in special education. Analysis of current special education research. Evaluation of impact upon the profession. Implications for additional research.

**SP ED 690: Advanced Special Topics**

Cr. 1-5. Repeatable, maximum of 4 times. S.SS.

*Prereq: 9 graduate credits in education*

Guided reading and/or study on special topics of an advanced nature.

**SP ED 699: Research**

Cr. arr.

*Prereq: 15 credits in education*

# Speech Communication (SP CM)

**Any experimental courses offered by SP CM can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## SP CM 110: Listening

(3-0) Cr. 3. F.S.

Theory, principles, and competency development in comprehensive, therapeutic, critical, consumer, and appreciative listening. The impact of listening in relationships and partnerships.

## SP CM 212: Fundamentals of Public Speaking

(3-0) Cr. 3. F.S.SS.

Theory and practice of basic speech communication principles applied to public speaking. Practice in the preparation and delivery of extemporaneous speeches.

## SP CM 216: America Speaks: Great Speakers and Speeches in US History

Cr. 3.

Survey of great speeches examined within their political and cultural contexts. Analysis of the rhetorical strategies of diverse speakers with an emphasis on texts from social movements in the United States.

## SP CM 275: Analysis of Popular Culture Texts

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in ENGL 250*

Analysis of how information and entertainment forms persuade and manipulate audiences. Study of several forms that may include newspapers, speeches, television, film, advertising, fiction, and magazines. Special attention to verbal and visual devices.

## SP CM 290: Special Projects

Cr. 1-2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: 3 credits in SP CM; Department Permission*

## SP CM 310: Rhetorical Analysis

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: ENGL 250*

Fundamental principles of rhetorical criticism. Focus on selected theories for analyzing cultural texts, including essays, speeches, film, technical and scientific documents, and websites. Emphasis on identifying artifacts, formulating research questions, applying methodologies, and understanding and practicing critical analysis through discussion and in writing.

## SP CM 312: Business and Professional Speaking

(3-0) Cr. 3. F.S.

Theory, principles, and competency development in the creation of coherent, articulate business and professional oral presentations. SP CM 212 or prior public speaking experience recommended.

## SP CM 323: Gender and Communication

(Cross-listed with WGS). (3-0) Cr. 3.

Examination of how understanding and enactment of gender identity is shaped by communication. Verbal and nonverbal communication across various contexts including personal relationships and the media. Explores discourse of social movements aiming to transform cultural definitions of gender.

Meets U.S. Diversity Requirement

## SP CM 324: Legal Communication

(3-0) Cr. 3.

*Prereq: SP CM 212*

Speech communication in the legal system inside and outside the trial process: interviewing and counseling, negotiating and bargaining, voir dire, opening statements, examination of witnesses, closing arguments, judge's instructions, jury behavior, and appellate advocacy.

## SP CM 350: Rhetorical Traditions

(Cross-listed with CL ST, ENGL). (3-0) Cr. 3. S.

*Prereq: ENGL 250*

Ideas about the relationship between rhetoric and society in contemporary and historical contexts. An exploration of classical and contemporary rhetorical theories in relation to selected topics that may include politics, gender, race, ethics, education, science, or technology.

## SP CM 417: Campaign Rhetoric

(Cross-listed with POL S). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: SP CM 212*

Backgrounds of candidates for state and national elections; selected speeches and issues; persuasive strategies and techniques of individual speakers.

## SP CM 418: Seminar in Argumentation

(Cross-listed with ENGL). (3-0) Cr. 3. F.S.

*Prereq: (ENGL 310 or SP CM 310); Junior classification*

Advanced seminar in theory and analysis with extensive practice in various modes of argument.

## SP CM 490: Independent Study

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 18 credits in SP CM; Junior classification; Department Permission*

Only one independent study enrollment is permitted within the department per semester.

**SP CM 495B: Independent Study: Teaching Speech**

(Cross-listed with EDUC). (3-0) Cr. 3. F.

*Prereq: 9 credits in SP CM; minimum GPA of 2.5 in SP CM courses*

Problems, methods, and materials related to teaching speech, theatre, and media in secondary schools.

**Courses primarily for graduate students, open to qualified undergraduates:**

**SP CM 513: Teaching Fundamentals of Public Speaking**

(3-0) Cr. 3. F.

*Prereq: Graduate classification; must be teaching Sp Cm 212 concurrently*

Introduction to the teaching of public speaking. Exploration of pedagogical theory and methods related to SP CM 212 objectives, pedagogical approaches, lesson planning, assignment development, and evaluation of student projects. Required of all new teaching assistants teaching SP CM 212.

**SP CM 540: Drama**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Graduate classification or 6 credits in literature at 300 level or above*

Primary texts in dramatic genres from various literary periods, in critical and cultural contexts. Frequently concentrates on the English Renaissance and the Shakespearean stage.

**SP CM 547: The History of Rhetorical Theory from the Classical Era to the Present**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: 6 credits in English*

Rhetorical theory from the classical period of ancient Greece through to the 20th century; attention to rhetoric's relation to the nature of knowledge, communication, practice, and pedagogy.

**SP CM 548: Cultural and Critical Theories of Communication and Rhetoric**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: 6 credits in English*

Contemporary theories that address the production, reception, and critical evaluation of cultural artifacts and communicative events; these theories address power, ideology, and the norms of public discourse. Theories covered may include Postmodernism, Feminist Theory, Public Sphere Theory, as well as Critical Race Theory, Social Justice Theory, Disability Theory, Queer Theory, and/or Intercultural Theories of Communication and Rhetoric.

**SP CM 549: Multimedia and Interaction Design**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: Senior classification*

Rhetorical principles of interactive multimedia design, such as those in streaming multimedia as part of workplace documents. Practical understanding of the computer applications used in interactive multimedia development. Focus on theoretical and practical elements of producing multimedia for training in both education and industry. Work with interactive hypertext, digital audio, and nonlinear video editing.

**SP CM 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 12 credits.

*Prereq: Permission of program chair*

**SP CM 592: Core Studies in Rhetoric, Composition, and Professional Communication**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**SP CM 592A: Core Studies: Rhetoric**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**SP CM 592B: Core Studies: Composition**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

*Prereq: 12 credits in rhetoric, linguistics, or literature, excluding ENGL 150 and ENGL 250*

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**SP CM 592C: Core Studies: Professional Communication**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Seminar on topics central to the fields of rhetoric and professional communication or composition.

**Courses for graduate students:**

**SP CM 611: Seminar in Rhetorical Theory**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable.

*Prereq: ENGL 547*

Rhetorical theory, criticism, and/or practice in relation to a historical period or a particular theoretical issue.

# Statistics (STAT)

**Any experimental courses offered by STAT can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## STAT 101: Principles of Statistics

(3-2) Cr. 4. F.S.SS.

Statistical concepts in modern society; descriptive statistics and graphical displays of data; the normal distribution; data collection (sampling and designing experiments); elementary probability; elements of statistical inference; estimation and hypothesis testing; linear regression and correlation; contingency tables. 1 1/2 years of high school algebra required. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

## STAT 104: Introduction to Statistics

(2-2) Cr. 3. F.S.SS.

Statistical concepts and their use in science; collecting, organizing and drawing conclusions from data; elementary probability; binomial and normal distributions; regression; estimation and hypothesis testing. For students in the agricultural and biological sciences. 1 1/2 years of high school algebra required. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

## STAT 110: Orientation in Statistics

(1-0) Cr. 1. F.

Opportunities, challenges, and the scope of the curriculum in statistics. For students planning or considering a career in this area.

## STAT 201: Introduction to Statistical Concepts and Methods

(3-2) Cr. 4. S.

*Prereq: Credit or concurrent enrollment in MATH 165*

Statistical thinking and applications of statistical concepts and methods in modern society. Display and summary of categorical and numerical data. Exploring relationships between variables, association, correlation, and regression. Observational studies and experiments. Probability concepts, random variables, discrete and continuous distributions. Elements of statistical inference; estimation and hypothesis testing. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

## STAT 202: Career Development in Math and Statistics

(Cross-listed with MATH). Cr. 1. S.

Career development in the mathematics and statistics disciplines with an emphasis on contemporary social issues. Presentations by professionals in STEM fields about occupations, decision-making strategies, and career goal implementation; development of job searching, resume writing, negotiating, and interviewing techniques. Offered on a satisfactory-fail basis only.

## STAT 226: Introduction to Business Statistics I

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 150 or MATH 165*

Obtaining, organizing, and presenting statistical data; measures of location and dispersion; the Normal distribution; sampling and sampling distribution of the sample mean; elements of statistical inference; confidence intervals and hypothesis testing for the mean; describing bivariate relationships and inference for simple linear regression analysis; use of computers to visualize and analyze data. Credit for only one of the following courses may be applied toward graduation: STAT 101, STAT 104, STAT 105, STAT 201, or STAT 226.

## STAT 231: Probability and Statistical Inference for Engineers

(4-0) Cr. 4. F.S.

*Prereq: Credit or concurrent enrollment in MATH 265 or MATH 265H*

Emphasis on engineering applications. Basic probability; random variables and probability distributions; joint and sampling distributions. Descriptive statistics; confidence intervals; hypothesis testing; simple linear regression; multiple linear regression; one way analysis of variance; use of statistical software.

## STAT 301: Intermediate Statistical Concepts and Methods

(3-2) Cr. 4. F.S.

*Prereq: STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 226 or STAT 231 or STAT 305 or STAT 322 or STAT 330*

Statistical concepts and methods used in the analysis of observational data. Analysis of single sample, two sample and paired sample data. Simple and multiple linear regression including polynomial regression and use of indicator variables. Model building and analysis of residuals. Introduction to one-way ANOVA, tests of independence for contingency tables, and logistic regression. Credit for only one of the following courses may be applied toward graduation: STAT 301, STAT 326, STAT 401, or STAT 587.

**STAT 305: Engineering Statistics**

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 165*

Statistics for engineering problem solving. Principles of engineering data collection; descriptive statistics; elementary probability distributions; principles of experimentation; confidence intervals and significance tests; one-, two-, and multi-sample studies; regression analysis; use of statistical software. Credit for both STAT 105 and STAT 305 may not be applied toward graduation.

**STAT 322: Probabilistic Methods for Electrical Engineers**

(Cross-listed with E E). (3-0) Cr. 3. F.S.

*Prereq: E E 224*

Introduction to probability with applications to electrical engineering. Sets and events, probability space, conditional probability, total probability and Bayes' rule. Discrete and continuous random variables, cumulative distribution function, probability mass and density functions, expectation, moments, moment generating functions, multiple random variables, functions of random variables. Elements of statistics, hypothesis testing, confidence intervals, least squares. Introduction to random processes.

**STAT 326: Introduction to Business Statistics II**

(2-2) Cr. 3. F.S.SS.

*Prereq: STAT 226*

Multiple regression analysis; regression diagnostics; model building; applications in analysis of variance and time series; random variables; distributions; conditional probability; use of computers to visualize and analyze data. Credit for only one of the following courses may be applied toward graduation: STAT 301, STAT 326, STAT 401, or STAT 587.

**STAT 330: Probability and Statistics for Computer Science**

(3-0) Cr. 3. F.S.SS.

*Prereq: MATH 166*

Topics from probability and statistics applicable to computer science. Basic probability; Random variables and their distributions; Stochastic processes including Markov chains; Queuing models; Basic statistical inference; Introduction to regression.

**STAT 332: Visual Communication of Quantitative Information**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 250; (STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 231 or STAT 305 or STAT 322 or STAT 330)*

Communicating quantitative information using visual displays; visualizing data; interactive and dynamic data displays; evaluating current examples in the media; color, perception, and representation in graphs; interpreting data displays.

**STAT 341: Introduction to the Theory of Probability and Statistics I**

(Cross-listed with MATH). (3-2) Cr. 4. F.S.

*Prereq: MATH 265 or MATH 265H*

Probability; distribution functions and their properties; classical discrete and continuous distribution functions; multivariate probability distributions and their properties; moment generating functions; transformations of random variables; simulation of random variables and use of the R statistical package. Credit for only one of the following courses may be applied toward graduation: STAT 341, STAT 347, STAT 447, or STAT 588.

**STAT 342: Introduction to the Theory of Probability and Statistics II**

(Cross-listed with MATH). (3-2) Cr. 4. F.S.

*Prereq: (MATH 207 or MATH 317); (STAT 101 or STAT 104 or STAT 105 or STAT 201 or STAT 226 or STAT 231 or STAT 305 or STAT 322 or STAT 330); STAT 341*

Sampling distributions; confidence intervals and hypothesis testing; theory of estimation and hypothesis tests; linear model theory; resampling methods; introduction to Bayesian inference; use of the R statistical package for simulation and data analysis.

**STAT 347: Probability and Statistical Theory for Data Science**

Cr. 4. F.

*Prereq: (MATH 207 or MATH 317); MATH 265; (STAT 301 or STAT 326)*

Introduction to probability; distribution functions and their properties; classical discrete and continuous distributions; sampling distributions; theory of estimation; theory of inference; use of R statistical package for simulation and data analysis. Credit for only one of the following courses may be applied toward graduation: STAT 341, STAT 347, STAT 447, or STAT 588.

**STAT 361: Statistical Quality Assurance**

(Cross-listed with I E). (2-2) Cr. 3. F.S.

*Prereq: STAT 231, STAT 301, STAT 326, STAT 401, or STAT 587*

Statistical methods for process improvement. Simple quality assurance principles and tools. Measurement system precision and accuracy assessment. Control charts. Process capability assessment. Experimental design and analysis for process improvement. Significant external project in process improvement.

**STAT 398: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Department Chair Permission*

Off-campus work periods for undergraduate students in a field of statistics.

**STAT 471: Introduction to Experimental Design**

(Dual-listed with STAT 571). (3-0) Cr. 3. F.S.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

The role of statistics in research and the principles of experimental design. Concepts of experimental and observational units, randomization, replication, blocking, subdividing and repeatedly measuring experimental units; factorial treatment designs and confounding; common designs including randomized complete block design, Latin square design, split-plot design, and analysis of data from such common designs; extensions of the analysis of variance to cover variance components. Determining sample size. Credit in only one of STAT 402, STAT 471, or STAT 571 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 472: Introduction to Time Series**

(Dual-listed with STAT 572). (3-0) Cr. 3. S.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 526 or STAT 587

Methods for analyzing data collected over time; review of multiple regression analysis. Elementary forecasting methods: moving averages and exponential smoothing. Autoregressive-moving average (Box-Jenkins) models: identification, estimation, diagnostic checking, and forecasting. Transfer function models and intervention analysis. Introduction to multivariate time series methods. Credit for only one of STAT 451, STAT 472, or STAT 572 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 473: Introduction to Survey Sampling**

(Dual-listed with STAT 573). (2-2) Cr. 3. S.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

Concepts of sample surveys and the survey process; methods of designing sample surveys, including: simple random, stratified, systematic, probability proportional to size, and multistage sampling designs; methods of analyzing sample surveys including ratio, regression, domain estimation and nonresponse.

**STAT 474: Introduction to Bayesian Data Analysis**

(Dual-listed with STAT 574). (2-2) Cr. 3. S.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

Probability models and prior distributions; updating priors through the likelihood function. Computational and simulation-based methods for deriving posterior distributions and for estimating parameters. Basic statistical and hierarchical models. Model adequacy and posterior predictive checks. Markov Chain Monte Carlo methods and introduction to WinBUGS or similar software. Emphasis on applications and examples from the social, biological and physical sciences. Credit for only one of STAT 444, STAT 474, or STAT 574 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 475: Introduction to Multivariate Data Analysis**

(Dual-listed with STAT 575). (2-2) Cr. 3. F.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

Statistical and graphical methods for displaying and analyzing multivariate data including plotting high-dimensional data using interactive graphics; organizing and summarizing analyses of multivariate data; comparing two group mean vectors; multivariate analysis of variance; reducing variable dimension with principal components; identifying factors with exploratory factor analysis; grouping observations with multidimensional scaling and cluster analysis; classification; R statistical software package and using Rstudio to create reports (RMarkdown and GGplot). Knowledge of linear algebra recommended. Credit for only one of STAT 407, STAT 475, or STAT 575 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 476: Introduction to Spatial Data Analysis**

(Dual-listed with STAT 576). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

The analysis of spatial data; geostatistical methods, mapping and spatial prediction; methods for areal data; models and methods for spatial point processes. Emphasis on application and practical use of spatial statistical analysis. Use of R and R packages for spatial data analysis. Credit for only one of STAT 406, STAT 476, or STAT 576 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.



**STAT 477: Introduction to Categorical Data Analysis**

(Dual-listed with STAT 577). (3-0) Cr. 3. S.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Statistical methods for the analysis of categorical data: graphical summaries, estimation and inference for proportions, sample size determination, chi-square tests, measures of relative risk, odds and association, analysis of paired data and measures of agreement, logistic regression models, log-linear models. Credit for only one of STAT 457, STAT 477, or STAT 577 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 478: Introduction to Stochastic Process Models**

(Dual-listed with STAT 578). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 231 or STAT 341 or STAT 347 or STAT 447 or STAT 588*

Probabilistic models in biological, engineering and the physical sciences. Markov chains; Poisson, birth-and-death, renewal, branching and queuing processes; applications to bioinformatics and other quantitative problems. Credit for only one of STAT 432, STAT 478, or STAT 578 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 482: Regression for Social and Behavioral Research**

(Dual-listed with STAT 582). (2-2) Cr. 3. F.S.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Applications of generalized linear regression models to social science data. Assumptions of regression; diagnostics and transformations; analysis of variance and covariance; logistic, multinomial and Poisson regression. Credit for only one of STAT 404, STAT 482, or STAT 582 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 483: Empirical Methods for the Computational Sciences**

(Dual-listed with STAT 583). (3-0) Cr. 3. F.

*Prereq: MATH 166; STAT 330*

Statistical methods for research involving computers; exploratory data analysis; selected topics from analysis of designed experiments - analysis of variance, hypothesis testing, interaction among variables; linear regression, logistic regression, Poisson regression; parameter estimation, prediction, confidence regions, dimension reduction techniques, model diagnostics and sensitivity analysis; Markov chains and processes; simulation techniques and bootstrap methods; applications to computer science, bioinformatics, computer engineering - programs, models and systems as objects of empirical study; communicating results of empirical studies. Statistical software: R. Knowledge of linear algebra recommended. Credit for only one of STAT 430, STAT 483, or STAT 583 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 484: Computer Processing of Scientific Data**

(Dual-listed with STAT 584). (3-0) Cr. 3. F.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Structure, content and programming aspects of modern statistical software packages. Advanced techniques for data management, graphics, exploratory data analysis, and generalized linear models. Credit for only one of STAT 479, STAT 484, or STAT 584 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 486: Introduction to Statistical Computing**

(Dual-listed with STAT 586). (3-0) Cr. 3. S.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Modern statistical computing. Topics may include: basic and advanced R programming; data management; spread sheets; verifying data accuracy; transferring data between software packages; data and graphical analysis with statistical software packages; algorithmic programming concepts and applications; simulation studies and resampling methods; software reliability; statistical modeling and machine learning. Credit for only one of STAT 480, STAT 486, or STAT 586 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 490: Independent Study**

Cr. arr. Repeatable, maximum of 9 credits.

*Prereq: 10 credits in STAT; Permission of Instructor*

No more than 9 credits in Stat 490 may be counted toward graduation.

**STAT 490H: Independent Study: Honors**

Cr. arr. Repeatable, maximum of 9 credits.

*Prereq: 10 credits in STAT; Permission of Instructor*

No more than 9 credits in Stat 490 may be counted toward graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

**STAT 500: Statistical Methods I**

(3-2) Cr. 4. F.

*Prereq: STAT 447 or STAT 588 or current enrollment in STAT 542; knowledge of matrix algebra.*

Analysis of data from designed experiments and observational studies. Randomization-based and model-based inference on group means; pairing/blocking and other uses of restricted randomization. Model assessment and diagnostics; remedial measures; alternative approaches based on ranks. Simple linear regression, multiple linear regression, and model selection criteria. Use of linear models to analyze data; least squares estimation; estimability; sampling distributions of estimators; general linear tests; inference for parameters and contrasts.

**STAT 501: Multivariate Statistical Methods**

(3-0) Cr. 3. S.

*Prereq: STAT 500; STAT 542; STAT 579 or equivalent; knowledge of matrix algebra.*

Statistical methods for analyzing and displaying multivariate data; the multivariate normal distribution; inference in multivariate populations, simultaneous analysis of multiple responses, multivariate analysis of variance; summarizing high dimensional data with principal components, factor analysis, canonical correlations, classification methods, clustering, multidimensional scaling; introduction to basic nonparametric multivariate methods. Statistical software: SAS or R.

**STAT 502: Applied Modern Multivariate Statistical Learning**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: STAT 500, STAT 542, STAT 579.*

A Statistics-MS-level introduction to Modern Multivariate Statistical Learning. Theory-based methods for modern data mining and machine learning, inference and prediction. Variance-bias trade-offs and choice of predictors; linear methods of prediction; basis expansions; smoothing, regularization, kernel smoothing methods; neural networks and radial basis function networks; bootstrapping, model averaging, and stacking; linear and quadratic methods of classification; support vector machines; trees and random forests; boosting; prototype methods; unsupervised learning including clustering, principal components, and multi-dimensional scaling; kernel mechanics. Substantial use of R packages implementing these methods.

**STAT 503: Exploratory Methods and Data Mining**

(2-2) Cr. 3. Alt. S., offered irregularly.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587; STAT 341 or STAT 347 or STAT 447 or STAT 542 or STAT 588; STAT 480 or STAT 486 or STAT 579 or STAT 586*

Approaches to finding the unexpected in data; exploratory data analysis; pattern recognition; dimension reduction; supervised and unsupervised classification; interactive and dynamic graphical methods; computer-intensive statistical techniques for large or high dimensional data and visual inference. Emphasis is on problem solving, topical problems, and learning how so-called black-box methods actually work.

**STAT 505: Environmental Statistics**

(3-0) Cr. 3.

*Prereq: STAT 447 or STAT 542 or STAT 588; STAT 401 or STAT 500 or STAT 587*

Statistical methods and models for environmental applications. Emphasis on environmental toxicology. Analysis of data with below detection-limit values. Dose-response curve modeling, including overdispersion and estimation of safe doses. Trend analysis; analysis of autocorrelated data. Equivalence testing.

**STAT 506: Statistical Methods for Spatial Data**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: STAT 447 or STAT 542 or STAT 588*

The analysis of spatial data; geostatistical methods and spatial prediction; discrete index random fields and Markov random field models; models for spatial point processes.

**STAT 510: Statistical Methods II**

(3-0) Cr. 3. S.

*Prereq: STAT 500; STAT 447 or STAT 588 or credit/enrollment in STAT 543*

Linear models and analysis of variance for multifactor experiments with balanced and unbalanced data. Likelihood analysis for general linear models and models with non-normal random components; linear model results in the context of likelihood; linear mixed models and their application; estimation, inference, and prediction. Introduction to generalized linear models and generalized linear mixed models. Case studies of applications including problem formulation, exploratory analysis, model development, estimation and inference, and model assessment.

**STAT 512: Design of Experiments**

(3-0) Cr. 3. F.

*Prereq: STAT 510*

Basic techniques of experimental design developed in the context of the general linear model; completely randomized, randomized complete block, and Latin Square designs; factorial experiments, confounding, fractional replication; split-plot and incomplete block designs.

**STAT 513: Response Surface Methodology**

(3-0) Cr. 3.

*Prereq: STAT 402 or STAT 471 or STAT 512 or STAT 571; knowledge of elementary matrix theory and matrix formulation of regression*

Analysis techniques for locating optimum and near-optimum operating conditions: standard experimental designs for first- and second-order response surface models; design performance criteria; use of data transformations; mixture experiments; optimization for multiple-response problems. Requires use of statistical software with matrix functions.

**STAT 515: Theory and Applications of Nonlinear Models**

(3-0) Cr. 3.

*Prereq: STAT 447 or STAT 543 or STAT 588; STAT 510*

Construction of nonlinear statistical models; random and systematic model components, additive error nonlinear regression with constant and non-constant error variances, generalized linear models, transform both sides models. Iterative algorithms for estimation and asymptotic inference. Basic random parameter models, beta-binomial and gamma-Poisson mixtures. Requires use of instructor-supplied and student-written R functions.

**STAT 516: Statistical Design and Analysis of Gene Expression Experiments**

(3-0) Cr. 3.

*Prereq: STAT 500; STAT 447 or STAT 542 or STAT 588*

Introduction to high-throughput technologies for gene expression studies (especially RNA-sequencing technology): the role of blocking, randomization, and biological and technical replication in the design of gene expression experiments; normalization methods; methods for identifying differentially expressed genes including mixed linear model analysis, generalized linear model analysis, generalized linear mixed model analysis, quasi-likelihood methods, and empirical Bayes analysis; procedures for controlling false discovery rate for multiple testing; clustering problems for gene expression data; testing gene categories; emphasis on current research topics for statistical analysis of high dimensional gene expression data.

**STAT 520: Statistical Methods III**

(3-0) Cr. 3. F.

*Prereq: STAT 510; STAT 447 or STAT 543 or STAT 588*

Nonlinear regression; generalized least squares; asymptotic inference. Generalized linear models; exponential dispersion families; maximum likelihood and inference. Designing Monte Carlo studies; bootstrap; cross-validation. Fundamentals of Bayesian analysis; data models, priors and posteriors; posterior prediction; credible intervals; Bayes Factors; types of priors; simulation of posteriors; introduction to hierarchical models and Markov Chain Monte Carlo methods.

**STAT 521: Theory and Applications of Sample Surveys**

(3-0) Cr. 3. S.

*Prereq: STAT 401 or STAT 500 or STAT 587; STAT 447 or STAT 542 or STAT 588*

Practical aspects and basic theory of design and estimation in sample surveys for finite populations. Simple random, systematic, stratified, cluster multistage and unequal-probability sampling. Horvitz-Thompson estimation of totals and functions of totals: means, proportions, regression coefficients. Linearization technique for variance estimation. Model-assisted ratio and regression estimation. Two-phase sampling and sampling on two occasions. Non-response effects. Imputation.

**STAT 522: Advanced Applied Survey Sampling**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: STAT 421 or STAT 473 or STAT 521 or STAT 573*

Advanced topics in survey sampling and methodology: clustering and stratification in practice, adjustments and imputation for missing data, variance estimation in complex surveys, methods of panel and/or longitudinal surveys, procedures to increase response rates, and computing. Examples are taken from large, well-known surveys in various subject areas.

**STAT 525: Statistical Methods for Mathematics Teachers**

(6-0) Cr. 6.

*Prereq: STAT 341 or equivalent*

Descriptive statistics; data collection through experimentation and sampling; univariate statistical inference; contingency tables; design of experiments and ANOVA; simple linear regression; logistic regression; multiple linear regression; statistics pedagogy. (Offered on a 3-year cycle; offered SS 2020.). May not be used for graduate credit in the Statistics program. Credit in STAT 410 or STAT 525, but not both, may be applied toward graduation.

**STAT 526: Applied Statistical Modeling**

Cr. 3. F.

*Prereq: Admission to Master of Business Analytics program*

Probability concepts and distributions used in statistical decision-making for business applications. Least-squares and maximum likelihood estimation, sampling distributions of estimators, formal statistical inference, analysis of variance, multiple regression models and strategies for model selection, logistic regression, and Poisson regression. Applications implemented with the R statistical package. Simulations used to investigate properties of inferential procedures and to assist in data analysis. May not be used for graduate credit in the Statistics program.

**STAT 528: Visual Business Analytics**

Cr. 3. F.

*Prereq: Admission to the Master of Business Analytics Program*

Types of data displays; numerical and visual summaries of data; data structures for data displays; data vs info graphics; good practices of displaying data; human perception and cognition in data displays; graphics as tools of data exploration; graphical diagnostics of statistical models and machine learning procedures; strategies and techniques for data visualizations; basics of reproducibility and repeatability; web-based interactive applets for visual presentation of data and results; programming in R. May not be used for graduate credit in the Statistics program.

**STAT 531: Quality Control and Engineering Statistics**

(Cross-listed with I E). (3-0) Cr. 3.

*Prereq: STAT 401 or STAT 587; STAT 342 or STAT 447 or STAT 588*

Statistical methods and theory applicable to problems of industrial process monitoring and improvement. Statistical issues in industrial measurement; Shewhart, CUSUM, and other control charts; feedback control; process characterization studies; estimation of product and process characteristics; acceptance sampling, continuous sampling and sequential sampling; economic and decision theoretic arguments in industrial statistics.

**STAT 533: Reliability**

(Cross-listed with I E). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: STAT 342 or STAT 432 or STAT 447 or STAT 478 or STAT 578 or STAT 588*

Probabilistic modeling and inference in engineering reliability; lifetime models, product limit estimator, probability plotting, maximum likelihood estimation for censored data, Bayesian methods in reliability, system reliability models, competing risk analysis, acceleration models and analysis of accelerated test data; analysis of recurrent events and degradation data; planning studies to obtain reliability data.

**STAT 534: Ecological Statistics**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 447 or STAT 542 or STAT 588*

Statistical methods for non-standard problems, illustrated using questions and data from ecological field studies. Estimation of abundance and survival from mark-recapture studies, deterministic and stochastic matrix models of population trends, integral projection models, and hierarchical modeling, especially of population dynamics. Additional topics vary based on student interest.

**STAT 536: Statistical Genetics**

(Cross-listed with GDCB). (3-0) Cr. 3.

*Prereq: STAT 401 or STAT 587; STAT 447 or STAT 588; GEN 320 or BIOL 313*

Statistical models and methods for genetics covering models of population processes: selection, mutation, migration, population structure, and linkage disequilibrium, and inference techniques: genetic mapping, linkage analysis, and quantitative trait analysis. Applications include genetic map construction, gene mapping, genome-wide association studies (GWAS), inference about population structure, phylogenetic tree construction, and forensic and paternity identification.

**STAT 542: Theory of Probability and Statistics I**

(4-0) Cr. 4. F.

*Prereq: MATH 414.*

Sample spaces, basic probability results, conditional probability. Random variables, univariate distributions, moment generating functions. Joint distributions, conditional distributions and independence, correlation and covariance. Probability laws and transformations. Introduction to the multivariate normal distribution. Sampling distributions, normal theory, sums and order statistics. Convergence concepts, the law of large numbers, the central limit theorem and delta method. Basics of stochastic simulation.

**STAT 543: Theory of Probability and Statistics II**

(3-0) Cr. 3. S.

*Prereq: STAT 542.*

Point estimation including method of moments, maximum likelihood and Bayes. Properties of point estimators, mean squared error, unbiasedness, consistency, loss functions. Large sample properties of maximum likelihood estimators. Exponential families, sufficiency, completeness, ancillarity, Basu's theorem. Hypothesis tests, Neyman-Pearson lemma, uniformly most powerful tests, likelihood ratio tests, Bayes tests. Interval estimation, inverting tests, pivotal quantities. Nonparametric theory, bootstrap.

**STAT 544: Bayesian Statistics**

(3-0) Cr. 3. S.

*Prereq: Credit or concurrent enrollment in STAT 543*

Specification of probability models; subjective, conjugate, and noninformative prior distributions; hierarchical models; analytical and computational techniques for obtaining posterior distributions; model checking, model selection, diagnostics; comparison of Bayesian and traditional methods.

**STAT 546: Nonparametric Methods in Statistics**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 510, STAT 542*

Overview of parametric versus nonparametric methods of inference; introduction to rank-based tests and/or nonparametric smoothing methods for estimating density and regression functions; smoothing parameter selection.

**STAT 547: Functional Data Analysis**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: STAT 543, STAT 510*

Theory and methods for analyzing functional data, which are data that take the forms of trajectories and images, possibly highly discretized and contaminated with noise. Topics include basic operations on functional data, necessary theoretical foundations, functional principal component analysis, kernel and spline smoothing, covariance modeling and estimation, dynamics modeling, concurrent regression models, functional linear models, inference for functional data, classification, and other optional topics.

**STAT 551: Time Series Analysis**

(3-0) Cr. 3. F.

*Prereq: STAT 447 or STAT 542 or STAT 588*

Concepts of trend and dependence in time series data; stationarity and basic model structures for temporal dependence; moving average and autoregressive error structures; analysis in time domain and in frequency domain; parameter estimation, prediction and forecasting; identification of appropriate model structure and model assessment techniques. Possible extended topics including non-linear models, dynamic models, state-space models.

**STAT 554: Stochastic Process Models**

(Cross-listed with MATH). (3-0) Cr. 3. F.

*Prereq: STAT 542*

Markov chains on discrete spaces in discrete and continuous time (random walks, Poisson processes, birth and death processes) and their long-term behavior. Optional topics may include branching processes, renewal theory, introduction to Brownian motion.

**STAT 557: Statistical Methods for Counts and Proportions**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 401 or STAT 500 or STAT 587; STAT 447 or STAT 543 or STAT 588*

Statistical methods for analyzing simple random samples when outcomes are counts or proportions; measures of association and relative risk, chi-squared tests, loglinear models, logistic regression and other generalized linear models, tree-based methods. Maximum likelihood estimation and large sample theory. Extensions to longitudinal studies and complex survey designs, models with fixed and random effects. Use of statistical software: SAS or R.

**STAT 559: Item Response Theory**

Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 401 or STAT 500 or STAT 587*

Statistical methods for analysis of binary and polytomous data using latent trait models. Application and theory of model selection and fit, dimensionality, differential item functioning and test development. Use of appropriate statistical software.

**STAT 565: Methods in Biostatistics and Epidemiology**

(Cross-listed with TOX). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 401 or STAT 500 or STAT 587; STAT 447 or STAT 543 or STAT 588*

Statistical methods commonly used in epidemiology and human and animal health studies. Overview of cohort studies, case-control studies and randomized clinical trials. Topics include inference procedures for disease risk factors, analysis of time-to-event and survival data, analysis of longitudinal studies of disease progression and health status, diagnostic test evaluation, and meta-analysis. Examples will come from recent studies of physical and mental health, nutrition and disease progression in human and animal populations. Use of statistical software: SAS or R.

**STAT 568: Statistical Bioinformatics**

(Cross-listed with BCB, COM S, GDCB). (3-0) Cr. 3. S.

*Prereq: BCB 567 or (BIOL 315 and one of STAT 430 or STAT 483 or STAT 583), credit or enrollment in GEN 409*

Statistical models for sequence data, including applications in genome annotation, motif discovery, variant discovery, molecular phylogeny, gene expression analysis, and metagenomics. Statistical topics include model building, inference, hypothesis testing, and simple experimental design, including for big data/complex models.

**STAT 570: Systems Biology**

(Cross-listed with BCB, COM S, CPR E, GDCB). (3-0) Cr. 3. S.

*Prereq: BCB 567 or COM S 311, COM S 228, GEN 409, STAT 430 or STAT 483 or STAT 583*

Algorithmic and statistical approaches in computational functional genomics and systems biology. Analysis of high throughput biological data obtained using system-wide measurements. Topological analysis, module discovery, and comparative analysis of gene and protein networks. Modeling, analysis, and inference of transcriptional regulatory networks, protein-protein interaction networks, and metabolic networks. Dynamic systems and whole-cell models. Ontology-driven, network based, and probabilistic approaches to information integration.

**STAT 571: Introduction to Experimental Design**

(Dual-listed with STAT 471). (3-0) Cr. 3. F.S.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

The role of statistics in research and the principles of experimental design. Concepts of experimental and observational units, randomization, replication, blocking, subdividing and repeatedly measuring experimental units; factorial treatment designs and confounding; common designs including randomized complete block design, Latin square design, split-plot design, and analysis of data from such common designs; extensions of the analysis of variance to cover variance components. Determining sample size. Credit in only one of STAT 402, STAT 471, or STAT 571 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 572: Introduction to Time Series**

(Dual-listed with STAT 472). (3-0) Cr. 3. S.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 526 or STAT 587

Methods for analyzing data collected over time; review of multiple regression analysis. Elementary forecasting methods: moving averages and exponential smoothing. Autoregressive-moving average (Box-Jenkins) models: identification, estimation, diagnostic checking, and forecasting. Transfer function models and intervention analysis. Introduction to multivariate time series methods. Credit for only one of STAT 451, STAT 472, or STAT 572 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 573: Introduction to Survey Sampling**

(Dual-listed with STAT 473). (2-2) Cr. 3. S.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

Concepts of sample surveys and the survey process; methods of designing sample surveys, including: simple random, stratified, systematic, probability proportional to size, and multistage sampling designs; methods of analyzing sample surveys including ratio, regression, domain estimation and nonresponse.

**STAT 574: Introduction to Bayesian Data Analysis**

(Dual-listed with STAT 474). (2-2) Cr. 3. S.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

Probability models and prior distributions; updating priors through the likelihood function. Computational and simulation-based methods for deriving posterior distributions and for estimating parameters. Basic statistical and hierarchical models. Model adequacy and posterior predictive checks. Markov Chain Monte Carlo methods and introduction to WinBUGS or similar software. Emphasis on applications and examples from the social, biological and physical sciences. Credit for only one of STAT 444, STAT 474, or STAT 574 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 575: Introduction to Multivariate Data Analysis**

(Dual-listed with STAT 475). (2-2) Cr. 3. F.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

Statistical and graphical methods for displaying and analyzing multivariate data including plotting high-dimensional data using interactive graphics; organizing and summarizing analyses of multivariate data; comparing two group mean vectors; multivariate analysis of variance; reducing variable dimension with principal components; identifying factors with exploratory factor analysis; grouping observations with multidimensional scaling and cluster analysis; classification; R statistical software package and using Rstudio to create reports (RMarkdown and GGplot). Knowledge of linear algebra recommended. Credit for only one of STAT 407, STAT 475, or STAT 575 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 576: Introduction to Spatial Data Analysis**

(Dual-listed with STAT 476). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq:* (STAT 301 or STAT 326 or STAT 401 or STAT 587); (STAT 341 or STAT 347 or STAT 447 or STAT 588)

The analysis of spatial data; geostatistical methods, mapping and spatial prediction; methods for areal data; models and methods for spatial point processes. Emphasis on application and practical use of spatial statistical analysis. Use of R and R packages for spatial data analysis. Credit for only one of STAT 406, STAT 476, or STAT 576 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.



**STAT 577: Introduction to Categorical Data Analysis**

(Dual-listed with STAT 477). (3-0) Cr. 3. S.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Statistical methods for the analysis of categorical data: graphical summaries, estimation and inference for proportions, sample size determination, chi-square tests, measures of relative risk, odds and association, analysis of paired data and measures of agreement, logistic regression models, log-linear models. Credit for only one of STAT 457, STAT 477, or STAT 577 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 578: Introduction to Stochastic Process Models**

(Dual-listed with STAT 478). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 231 or STAT 341 or STAT 347 or STAT 447 or STAT 588*

Probabilistic models in biological, engineering and the physical sciences. Markov chains; Poisson, birth-and-death, renewal, branching and queuing processes; applications to bioinformatics and other quantitative problems. Credit for only one of STAT 432, STAT 478, or STAT 578 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 579: An Introduction to R**

(0-2) Cr. 1. F.

*Prereq: Enrollment in STAT 500*

An introduction to the logic of programming, numerical algorithms, and graphics. The R statistical programming environment will be used to demonstrate how data can be stored, manipulated, plotted, and analyzed using both built-in functions and user extensions. Concepts of modularization, looping, vectorization, conditional execution, and function construction will be emphasized.

**STAT 580: Statistical Computing**

(3-0) Cr. 3. S.

*Prereq: STAT 579; STAT 447 or STAT 588 or STAT 542*

Introduction to scientific computing for statistics using C: Introduction to C for computing and memory efficiency; design of statistical algorithms; use of algorithms in modern libraries, parallel computing. Interfacing R with C. Building statistical libraries. Statistical computing: solving nonlinear equations; optimization; integration; simulation methods, inversion of probability integral transformations, rejection sampling, importance sampling.

**STAT 581: Analysis of Gene Expression Data for the Biological Sciences**

(3-0) Cr. 3. S.

*Prereq: STAT 401 or STAT 587*

Introduction to high-throughput technologies for gene expression studies (especially RNA-sequencing technology): the role of blocking, randomization, and biological and technical replication in the design of gene expression experiments; normalization methods; methods for identifying differentially expressed genes including mixed linear model analysis, generalized linear model analysis, generalized linear mixed model analysis, quasi-likelihood methods, empirical Bayes analysis, and resampling based approaches; procedures for controlling false discovery rate for multiple testing; clustering and classification problems for gene expression data; testing gene categories; emphasis on practical use of methods. May not be used for graduate credit in the Statistics MS and PhD degree programs. Credit in STAT 416 or STAT 581, but not both, may be applied toward graduation.

**STAT 582: Regression for Social and Behavioral Research**

(Dual-listed with STAT 482). (2-2) Cr. 3. F.S.

*Prereq: STAT 301 or STAT 326 or STAT 401 or STAT 587*

Applications of generalized linear regression models to social science data. Assumptions of regression; diagnostics and transformations; analysis of variance and covariance; logistic, multinomial and Poisson regression. Credit for only one of STAT 404, STAT 482, or STAT 582 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 583: Empirical Methods for the Computational Sciences**

(Dual-listed with STAT 483). (3-0) Cr. 3. F.

*Prereq: MATH 166; STAT 330*

Statistical methods for research involving computers; exploratory data analysis; selected topics from analysis of designed experiments - analysis of variance, hypothesis testing, interaction among variables; linear regression, logistic regression, Poisson regression; parameter estimation, prediction, confidence regions, dimension reduction techniques, model diagnostics and sensitivity analysis; Markov chains and processes; simulation techniques and bootstrap methods; applications to computer science, bioinformatics, computer engineering - programs, models and systems as objects of empirical study; communicating results of empirical studies. Statistical software: R. Knowledge of linear algebra recommended. Credit for only one of STAT 430, STAT 483, or STAT 583 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 584: Computer Processing of Scientific Data**

(Dual-listed with STAT 484). (3-0) Cr. 3. F.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

Structure, content and programming aspects of modern statistical software packages. Advanced techniques for data management, graphics, exploratory data analysis, and generalized linear models. Credit for only one of STAT 479, STAT 484, or STAT 584 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 585: Data Technologies for Statistical Analysis.**

Cr. 3. Alt. S., offered odd-numbered years.

*Prereq:* STAT 579.

Introduction to computational methods for data analysis. Accessing and managing data formats: flat files, databases, web technologies based on mark-up languages (SML, KML, HTML), netCDF. Elements of text processing: regular expressions for cleaning data. Working with massive data, handling missing data, scaled computing. Efficient programming, reproducible code.

**STAT 586: Introduction to Statistical Computing**

(Dual-listed with STAT 486). (3-0) Cr. 3. S.

*Prereq:* STAT 301 or STAT 326 or STAT 401 or STAT 587

Modern statistical computing. Topics may include: basic and advanced R programming; data management; spread sheets; verifying data accuracy; transferring data between software packages; data and graphical analysis with statistical software packages; algorithmic programming concepts and applications; simulation studies and resampling methods; software reliability; statistical modeling and machine learning. Credit for only one of STAT 480, STAT 486, or STAT 586 may be applied to graduation. May not be used for graduate credit in the Statistics MS and PhD degree programs.

**STAT 587: Statistical Methods for Research Workers**

(3-2) Cr. 4. F.S.SS.

*Prereq:* An applied statistics course at the undergraduate level, such as STAT 101, 104, 105, 201, or 226. Students without an equivalent course should contact the department.

A first course in statistics for graduate students from the applied sciences. Principles of data analysis and scientific inference, including estimation, hypothesis testing, and the construction of interval estimates. Statistical concepts and models, including group comparison, blocking, and linear regression. Different sections are designed for students in various disciplines, and additional methods covered may depend on the target audience. Topics covered may include basic experimental designs and analysis of variance for those designs, analysis of categorical data, logistic and log-linear regression, likelihood-based inference, and the use of simulation. Equivalent to STAT 401 in previous catalogs. May not be used for graduate credit in the Statistics MS and PhD degree programs. Credit in STAT 401 or STAT 587, but not both, may be applied toward graduation.

**STAT 588: Statistical Theory for Research Workers**

(4-0) Cr. 4. F.S.SS.

*Prereq:* MATH 151 and permission of instructor, or MATH 265

Provides an introduction to the theoretical basis of fundamental statistical methods for graduate students in the applied sciences. Probability and probability distributions, moments and moment generating functions, conditional expectation, and transformation of random variables. Estimation based on loss functions, maximum likelihood, and properties of estimators. Sampling distributions, exact and asymptotic results, and the development of intervals. Principles of Bayesian analysis, inference from posterior distributions, and optimal prediction. Uses simulation to verify and extend theoretical results. Equivalent to STAT 447 in previous catalogs. May not be used for graduate credit in the Statistics MS and PhD degree programs. Credit in STAT 447 or STAT 588, but not both, may be applied toward graduation.

**STAT 590: Special Topics**

Cr. arr. Repeatable.

**STAT 590A: Special Topics: Theory**

Cr. arr. Repeatable.

**STAT 590B: Special Topics: Methods**

Cr. arr. Repeatable.

**STAT 590C: Special Topics: Design of Experiments**

Cr. arr. Repeatable.

**STAT 590D: Special Topics: Sample Surveys**

Cr. arr. Repeatable.

**STAT 590E: Special Topics: Statistics Education**

Cr. arr. Repeatable.

**STAT 590F: Special Topics: Statistical Computing and Graphics**

Cr. arr. Repeatable. F.

**STAT 598: Cooperative Education**

Cr. R. F.S.SS.

*Prereq: Permission of the department chair*

Off-campus work periods for graduate students in a field of statistics.

**STAT 599: Creative Component**

Cr. arr.

**Courses for graduate students:****STAT 601: Advanced Statistical Methods**

(3-0) Cr. 3. S.

*Prereq: STAT 520, STAT 543 and MATH 414 or enrollment in STAT 641*

Methods of constructing complex models including adding parameters to existing structures, incorporating stochastic processes and latent variables. Use of modified likelihood functions; quasi-likelihoods; profiles; composite likelihoods. Asymptotic normality as a basis of inference; Godambe information. Sample reuse; block bootstrap; resampling with dependence. Simulation for model assessment. Issues in Bayesian analysis.

**STAT 602: Modern Multivariate Statistical Learning**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: STAT 520, STAT 543, STAT 579*

Statistical theory and methods for modern data mining and machine learning, inference, and prediction. Variance-bias trade-offs and choice of predictors; linear methods of prediction; basis expansions; smoothing, regularization, and reproducing kernel Hilbert spaces; kernel smoothing methods; neural networks and radial basis function networks; bootstrapping, model averaging, and stacking; linear and quadratic methods of classification; support vector machines; trees and random forests; boosting; prototype methods; unsupervised learning including clustering, principal components, and multi-dimensional scaling; kernel mechanics.

**STAT 606: Advanced Spatial Statistics**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: STAT 506, STAT 543*

Consideration of advanced topics in spatial statistics, including areas of recent development in modern spatial statistics. Topics may include spatial sampling design; spatial Markov random fields; non-Gaussian spatial models, including spatial generalized linear mixed effects model; spatial Bayesian hierarchical models, simulation of random fields; spatial-temporal process models; non-stationary process models; multivariate spatial process models; spectral methods for spatial data; computational methods for large spatial data, spatial models for stream networks. Use of R to analyze various real spatial data.

**STAT 611: Theory and Applications of Linear Models**

(3-0) Cr. 3. F.

*Prereq: STAT 510; STAT 542 or STAT 447 or STAT 588; a course in matrix algebra*

Matrix preliminaries, estimability, theory of least squares and of best linear unbiased estimation, analysis of variance and covariance, distribution of quadratic forms, extension of theory to mixed and random effects models, restricted maximum likelihood estimation and inference for variance components.

**STAT 612: Advanced Design of Experiments**

(3-0) Cr. 3. Alt. S., offered irregularly.

*Prereq: STAT 512*

General theory of factorial experiments. Design optimality criteria, approximate design and general equivalence theory, computational approaches to constructing optimal designs for linear models, and extensions to nonlinear models. Advanced topics of current interest in the design of experiments, including one or more of: distance based design criteria and construction of spatial process models, screening design strategies for high-dimensional problems, and design problems associated with computational experiments.

**STAT 615: Advanced Bayesian Methods**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 544 and STAT 601*

Complex hierarchical and multilevel models, dynamic linear and generalized linear models, spatial models. Bayesian nonparametric methods. Specialized Markov chain Monte Carlo algorithms and practical approaches to increasing mixing and speed convergence. Summarizing posterior distributions, and issues in inference. Model assessment, model selection, and model averaging.

**STAT 621: Advanced Theory of Survey Statistics**

(3-0) Cr. 3. Alt. F., offered irregularly.

*Prereq: STAT 521*

Advanced topics of current interest in the design of surveys and analysis of survey data, including: asymptotic theory for design and model-based estimators, use of auxiliary information in estimation, variance estimation techniques, small area estimation, non-response modeling and imputation.

**STAT 641: Foundations of Probability Theory**

(Cross-listed with MATH). (3-0) Cr. 3. F.

*Prereq: MATH 414 or MATH 501 or equivalent course.*

Sequences and set theory; Lebesgue measure, measurable functions. Absolute continuity of functions, integrability and the fundamental theorem of Lebesgue integration. General measure spaces, probability measure, extension theorem and construction of Lebesgue-Stieljes measures on Euclidean spaces. Measurable transformations and random variables, induced measures and probability distributions. General integration and expectation, Lp-spaces and integral inequalities. Uniform integrability and absolute continuity of measures. Probability densities and the Radon-Nikodym theorem. Product spaces and Fubini-Tonelli theorems.

**STAT 642: Advanced Probability Theory**

(Cross-listed with MATH). (3-0) Cr. 3. S.

*Prereq: STAT 641, or STAT 543 and MATH 515*

Probability spaces and random variables. Kolmogorov's consistency theorem. Independence, Borel-Cantelli lemmas and Kolmogorov's 0 - 1 Law. Types and characterizations of convergence for random variables. Sums of independent random variables, empirical distributions, weak and strong laws of large numbers. Convergence in distribution and its formulations, tightness, characteristic functions, central limit theorems and Lindeberg-Feller conditions. Conditional probability and expectation, discrete parameter martingales.

**STAT 643: Advanced Theory of Statistical Inference**

(3-0) Cr. 3. F.

*Prereq: STAT 543, STAT 642*

Foundational concepts for likelihood, including sufficiency, completeness, exponential families, statistical information. Elements of decision theory, risk management strategies, theoretical properties of decision rules. Large-sample properties of maximum likelihood and Bayesian estimation, consistency, asymptotic normality, efficiency, likelihood ratios. Potential additional topics including M-estimation, U-statistics, nonparametric inference.

**STAT 644: Advanced Bayesian Theory**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 544 and STAT 642*

Exchangeability, parametric models, consistency and asymptotic normality of posterior distributions, posterior robustness, selection of priors using formal rules, improper priors and posterior propriety, Bayes factors, model selection, MCMC theory, irreducibility, Harris recurrence, regeneration, minorization and drift conditions, ergodicity, central limit theorems, Gibbs samplers, Metropolis Hastings samplers, techniques for speeding up convergence of certain MCMC algorithms.

**STAT 645: Advanced Stochastic Processes**

(Cross-listed with MATH). (3-0) Cr. 3. S.

Weak convergence. Random walks and Brownian motion. Martingales. Stochastic integration and Ito's Formula. Stochastic differential equations and applications.

**STAT 647: Advanced Multivariate Analysis**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 543, knowledge of matrix algebra*

Classical and high dimensional multivariate methods and their theories; multivariate random vectors and their distributions (multivariate normal, elliptical contour distributions); dependence measures and copulas; Wishart distribution and distributions for quadratic form statistics; Hotelling's T square test and its derivation; high-dimensional inference for mean and covariance, concentration inequalities, random matrix theory, signal detection and identification.

**STAT 648: Seminar on Theory of Statistics and Probability**

Cr. arr. Alt. F., offered irregularly.

*Prereq: STAT 543.*

Seminar topics change with each offering.

**STAT 651: Advanced Time Series**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 551, STAT 642*

Estimation and distributional theory for time series, generalized estimating functions, M-estimation, frequency domain estimation. Limit theorems under time dependence, mixing, long-memory. Approximations of sampling distributions and standard errors for time series statistics, bootstrap, subsampling.

**STAT 680: Advanced Statistical Computing**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 543 and STAT 580*

Normal approximations to likelihoods. The delta-method and propagation of errors. Topics in the use of the E-M algorithm including; its use in the exponential family, computation of standard errors, acceleration. Resampling methods: brief theory and application of the jackknife and the bootstrap. Randomization tests. Stochastic simulation: Markov Chain, Monte Carlo, Gibbs' sampling, Hastings-Metropolis algorithms, critical slowing-down and remedies, auxiliary variables, simulated tempering, reversible-jump MCMC and multi-grid methods.

**STAT 690: Advanced Special Topics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor***STAT 690A: Advanced Special Topics: Theory**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 690B: Advanced Special Topics: Methods**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 690C: Advanced Special Topics: Design of Experiments**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 690D: Advanced Special Topics: Sample Surveys**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 690E: Advanced Special Topics: Statistical Computing**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 690F: Advanced Special Topics: Graphics**

Cr. arr. Repeatable.

*Prereq: Permission of instructor*

**STAT 699: Research**

Cr. arr. Repeatable.

## Supply Chain Management (SCM)

*Any experimental courses offered by SCM can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistings/](http://registrar.iastate.edu/faculty-staff/courses/explistings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistings/>)

**Courses primarily for undergraduates:**

**SCM 301: Supply Chain Management**

(3-0) Cr. 3.

*Prereq: ECON 101 and STAT 226*

Introduction to a wide range of supply chain management (SCM) terminology, analytical tools, and theories as related to the supply chain operations reference model (SCOR). The SCOR model focuses on planning, sourcing, making, delivering, returning, and integrating key aspects within SCM. Using an analytical approach to solve real world problems, specific topics include: strategic sourcing, supply management, demand forecasting, inventory management, process management, logistics, process integration, and returns.

**SCM 303: Healthcare Quality Management**

(Cross-listed with HCM). Cr. 3. F.S.

*Prereq: SCM 301; credit or concurrent enrollment in HCM 301*

Addresses the manager's role in improving healthcare quality and outcomes, including clinical and organizational improvement, and quality improvement practices. Explores how healthcare delivery systems can better measure outcomes from both patient and organizational perspectives. Analyzes quality improvement programs and examines their adaptability to the healthcare environment.

**SCM 340: Project Management**

(Cross-listed with MIS). (3-0) Cr. 3.

*Prereq: credit or enrollment in MIS 301*

Equips students to support team activities in the general project management environment and better manage their careers. Practical experience using project management techniques and tools. Course topics include project initiation and execution, risk assessment, estimating and contracts, planning, human factors, and standard methods.

**SCM 424: Process Management, Analysis, and Improvement**

(3-0) Cr. 3.

*Prereq: SCM 301*

The design, analysis, and management of production processes to improve performance. Performance measures and their relationships; process design and evaluation; and managerial levers for improving and controlling process performance.

**SCM 428: Special Topics in Operations Management**

(3-0) Cr. 3.

*Prereq: SCM 301*

In-depth analysis of current issues, problems, and systems in operations management with emphasis on new theoretical and methodological developments. Topics may include in different semesters, supply chain management, productivity and quality improvement, management of technology and innovation, information technology in operations management, quick response manufacturing, and service operations management.

**SCM 430: Supply Chain Analytics**

Cr. 3. Alt. S., offered irregularly.

*Prereq: SCM 301*

Introduces key methods and tools (i.e., analytics) applied to decision making in supply chain practice. Use of data, statistical and quantitative analysis, explanatory and predictive models, and fact-based management to drive decisions and actions. Descriptive, prescriptive or predictive use activities. Use of software (e.g., R and AnyLogic) to learn key concepts and techniques in analytics and apply those concepts to examples of supply chain decision making.

**SCM 440: Supply Chain Information Systems**

(Cross-listed with MIS). (3-0) Cr. 3.

*Prereq: MIS 301, SCM 301*

Internal and inter-organizational information systems necessary for a supply chain to achieve competitive advantage. Topics include: design, development, implementation, and maintenance of supply chain information systems; enterprise resource planning; advanced planning and scheduling, manufacturing execution systems; and the interface between manufacturing planning and control processes, logistics processes, and the information system.

**SCM 450: Enterprise Resource Planning Systems in Supply Chain**

(Cross-listed with MIS). (3-0) Cr. 3.

*Prereq: SCM 301, MIS 301 or I E 148, I E 341*

Examination of the role of enterprise resource planning systems (ERP) in the supply chain. Hands-on experience with a major software application in use by many corporations to manage and improve the efficiency of their supply chains and operations. Students will develop a more process-centric perspective about how a supply chain operates and how ERP enables and supports such operations.

**SCM 453: Supply Chain Planning and Control**

(3-0) Cr. 3. F.

*Prereq: SCM 301*

Supply chain planning and control is the process which synchronizes demand with manufacturing and distribution. This course will cover sales and operations planning with emphasis on forecasting, master scheduling, materials requirements planning, inventory management and demand planning. Linking business plans and information systems for integration and distribution channels are also covered.

**SCM 460: Decision Tools for Logistics and Operations Management**

(3-0) Cr. 3.

*Prereq: SCM 301*

Technical tools and skills required for problem solving and decision making in logistics and operations management. Transportation and network planning, inventory decision making, facility location planning, vehicle routing, scheduling, and production planning. Quantitative tools include linear and integer programming, non-linear programming, and simulation. Emphasis on the use of PC-based spreadsheet programs.

**SCM 461: Principles of Transportation**

(3-0) Cr. 3.

*Prereq: SCM 301*

Economic, operating, and service characteristics of the various modes of transportation, with a special emphasis on freight transportation. Factors that influence transport demand, costs, market structures, carrier pricing, and carrier operating and service characteristics and their influence on other supply chain costs and supply chain performance.

**SCM 462: Transportation Carrier Management**

(3-0) Cr. 3.

*Prereq: Credit or enrollment in SCM 461*

Analysis of transport users' requirements. Carrier management problems involving ownership and mergers, routes, competition, labor, and other decision areas.

**SCM 466: Global Trade Management**

(3-0) Cr. 3. F.S.

*Prereq: SCM 301*

Logistics systems and legal framework for the international movement of goods. Operational characteristics of providers of exporting and importing services. The effects of government trade policies on global logistics.

**SCM 471: Sustainable Supply Chain Management**

Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: SCM 301*

The global nature of a supply chain causes many sustainability issues. This course will consider how supply chain design and execution affect sustainability. Some discussion of governmental policy will be included.

**SCM 473: War and Peace and Supply Chains**

(3-0) Cr. 3.

*Prereq: SCM 301*

Explore how supply chains do or do not support sustainable peace and human flourishing. Topics include how supply chain operations affect peace; how supply chains can be incentivized to encourage peace; how supply chain choices affect peace and what affects these choices; how supply chain certifications affect peace; tools available to supply chain managers to evaluate their decisions with regard to peace; and what business or supply chain models encourage peace.

**SCM 486: Principles of Purchasing and Supply Management**

(3-0) Cr. 3.

*Prereq: SCM 301*

Sourcing strategies, concepts, tools and dynamics in the context of the integrated supply chain. Make or buy decision, supplier evaluation and selection, global sourcing, the total cost of ownership, contracts and legal terms, negotiation, purchasing ethics, and information systems requirements.

**SCM 490: Independent Study**

Cr. 1-3. Repeatable.

*Prereq: SCM 301, senior classification, permission of instructor*

**SCM 491: International Live Case and Study Tour**

Cr. 3. S.

*Prereq: SCM 301*

Students follow supply chain of major firm from overseas manufacturer to domestic point-of-sale. Students are expected to complete projects and present findings to senior leadership.



**SCM 495: Executive Analysis and Presentations**

(3-0) Cr. 3. Repeatable. F.S.

*Prereq: Credit or enrollment in SCM 301*

Students explore different practical scenarios related supply chain projects and cases. Students acquire necessary skills and knowledge to solve practical issues associated with presented cases and problems. Students compete at different venues around the country. Only 3 credits of SCM 495 may count as a Supply Chain Management major choice elective.

**Courses primarily for graduate students, open to qualified undergraduates:**

**SCM 501: Supply Chain Management**

(3-0) Cr. 3.

*Prereq: Enrollment in MBA program or departmental permission*

Introduction to supply chain management including aspects of operations, logistics and global supply chain strategy development. Topic areas include lean manufacturing and value stream mapping; supplier development and measurement; sustainable supply chain operations; process measurement, management and improvement; supply chain risk and uncertainty; visibility and integration in the supply chain; and inventory control.

**SCM 503: Healthcare Supply Chain Management**

(3-0) Cr. 3. F.

*Prereq: Admission into MHAO program*

Healthcare supply chain management presents unique challenges for administrators and providers. Exploration of common supply chain management topics in a healthcare context including purchasing, operations, and logistics. Specific topics include operations in a highly regulated environment, professional services outsourcing, clinical integration via information technologies, service process design, capacity management, and quality and process improvement in a healthcare setting.

**SCM 513: Biorenewables Supply Chain Management**

Cr. 3. Repeatable, maximum of 1 times. S.

*Prereq: Graduate Standing or Qualified Undergraduate with Instructor Permission*

Evaluation of supply chain logistics related to the field of biorenewables. Unique challenges associated with the biorenewables supply chain are emphasized and examined: cost analysis, market demand & prices, life cycle analysis, environmental impacts, as well as the technological, social, and political factors related to society.

**SCM 520: Decision Models for Supply Chain Management**

(3-0) Cr. 3.

*Prereq: SCM 501 or permission of instructor*

The application of decision models for supply chain management. Topics include business applications of decision theory, inventory theory, business forecasting, optimization models, transportation and network models, routing problems, and project management.

**SCM 524: Strategic Process Analysis and Improvement**

(3-0) Cr. 3.

*Prereq: SCM 501 or permission of instructor*

Analysis, management, and improvement of the business processes used to produce and deliver products and services that satisfy customer needs. Process attributes that managers can control to influence the key operational performance measures of throughput time, inventory, cost, quality, and flexibility are discussed. Topics such as theory of constraints, lean production, and six sigma are included.

**SCM 540: Enterprise Supply Chain Information Systems**

(3-0) Cr. 3.

The purpose of this course is to examine the role of enterprise resource planning systems (ERP) in the supply chain. This course will provide students with hands-on experience with a major software application in use by many corporations to manage and improve the efficiency of their supply chain. In particular, this class will utilize an ERP system to help students develop a more process-centric perspective about how a supply chain operates. Students will have the opportunity to use the SAP ERP software package on key processes that most ERP systems utilize (i.e., purchasing, MRP, forecasting, order fulfillment and pricing). The course is also dedicated to understanding the tactical and operational management of supply chains. This course will discuss issues related to the creation of end-user value through supply chain cost reductions, service improvements, or both.

**SCM 553: Supply Chain Planning and Control**

Cr. 3. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: SCM 501 or permission of instructor*

Supply chain planning and control is the process which synchronizes demand with manufacturing and distribution. Sales and operations planning with emphasis on forecasting, master scheduling, materials requirements planning, inventory management and demand planning. Linking business plans and information systems for integration and distribution channels are also covered. Emphasis on the strategic advantages of linking business plans and demand forecasts.

**SCM 560: Strategic Logistics Management**

(3-0) Cr. 3.

*Prereq: SCM 501 or permission of instructor*

Positions logistics vis-a-vis supply chain management (SCM). Presents different perspectives on SCM vs. logistics. Describes primary logistics functions: transportation, warehousing, facility location, customer service, order processing, inventory management and packaging. Benefits of and obstacles to the integration of these functions.

**SCM 561: Transportation Management and Policy**

(3-0) Cr. 3.

*Prereq: SCM 501 or permission of instructor*

Analysis of contemporary issues and strategies in transportation management and policy. Emphasis on evaluation of the impacts of transportation policies, new technologies, and strategic carrier and shipper management practices on the freight transportation industry and logistics systems.

**SCM 563: Purchasing and Supply Management**

(3-0) Cr. 3.

*Prereq: SCM 501 or permission of instructor*

Mechanics, procedures and tools used in purchasing. Recruiting, selecting, developing and managing supply chain partners in order to achieve competitive advantage via superior supply chain management. Factors and information needs for making supply management decisions.

**SCM 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Graduate classification and permission of instructor*

For students who wish to do individual research in a particular area of supply chain management.

**Courses for graduate students:****SCM 601: Theoretical Foundations of Supply Chain Management**

(3-0) Cr. 3.

*Prereq: MGMT 601 or permission of instructor*

An overview of the development of supply chain management (SCM) theory, including review of seminal articles in logistics, operations, and purchasing management and theories from allied disciplines (e.g., economics, marketing, sociology, strategic management). Analysis of trends in SCM research topics and methodologies. Identification of emerging and future areas for research and theory development.

**SCM 603: Seminar in Purchasing**

(3-0) Cr. 3.

*Prereq: SCM 601 or concurrent enrollment*

Review of classic purchasing theories. Discussion of contemporary supply management strategy; the role of supply management and its relationship with other functional areas; its impact on logistics and transportation issues; management of supply uncertainties.

**SCM 604: Seminar in Logistics Management**

(3-0) Cr. 3.

*Prereq: SCM 601 or concurrent enrollment*

Integration of network, economic, and systems theory in the design, management, and control of logistics systems in the context of integrated supply chain management. Functional areas addressed include transportation, inventory order fulfillment, distribution, and warehousing. Facility location analysis will also be covered.

**SCM 605: Seminar in Operations Management**

(3-0) Cr. 3.

*Prereq: SCM 601 or concurrent enrollment*

Review of the research literature on methods of organizing, planning, controlling, and improving manufacturing systems to achieve the desired performance objectives related to cost, quality, speed, and flexibility. The relationship between the performance of the manufacturing system and the performance of the supply chain system will also be discussed.

**SCM 609: Special Topics in SCM**

Cr. 3. Repeatable. Alt. F., offered irregularly. Alt. S., offered irregularly.

*Prereq: SCM 601 or permission of instructor.*

Review of current issues in SCM. Provides opportunities to read and discuss research articles that made important contributions in SCM literature.

**SCM 650: Research Practicum I**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a research manuscript to be submitted to a peer-reviewed academic journal. Students will work with a faculty mentor on a research project.

**SCM 651: Research Practicum II**

(1-0) Cr. 1.

*Prereq: enrollment in the PhD program*

Preparation of a second research manuscript to be submitted to a peer-reviewed academic journal. Although students work under the supervision of a faculty mentor, the students will take independent responsibility for the research project.

**SCM 699: Dissertation**

Cr. 12.

*Prereq: Graduate classification, permission of dissertation supervisor Research.*

## Sustainable Agriculture (SUSAG)

*Any experimental courses offered by SUSAG can be found at:*

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**SUSAG 509: Agroecosystems Analysis**

(Cross-listed with AGRON, SOC). (3-4) Cr. 4. F.

*Prereq: Senior or above classification; permission of instructor*

Experiential, interdisciplinary examination of Midwestern agricultural and food systems, emphasizing both field visits and classroom activities. Focus on understanding multiple elements, perspectives (agronomic, economic, ecological, social, etc.), and scales of operation.

**SUSAG 515: Integrated Crop and Livestock Production Systems**

(Cross-listed with A B E, AGRON, AN S). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: SUSAG 509*

Methods to maintain productivity and minimize the negative ecological effects of agricultural systems by understanding nutrient cycles, managing manure and crop residue, and utilizing multispecies interactions. Crop and livestock production within landscapes and watersheds is also considered. Course includes a significant field component, with student teams analyzing Iowa farms.

**SUSAG 530: Ecologically Based Pest Management Strategies**

(Cross-listed with AGRON, ENT, PL P). (3-0) Cr. 3. Alt. F., offered even-numbered years.

Durable, least-toxic strategies for managing weeds, pathogens, and insect pests, with emphasis on underlying ecological processes.

**SUSAG 544: Sociology of Food and Agricultural Systems**

(Cross-listed with SOC). (3-0) Cr. 3.

*Prereq: SOC 325 or graduate standing*

Social organization of food and fiber production, processing, and distribution systems. Sociological comparison of conventional and alternative production systems; gender roles in agriculture and food systems; local, national and global food systems; perspectives on food and agricultural research and policy.

**SUSAG 546: Strategies for Diversified Food and Farming Systems**

(Cross-listed with AGRON, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: SUSAG 509*

Project-focused engagement in food and farming systems using tools and perspectives drawn from multiple disciplines. Includes a field component.

**SUSAG 549: Sociology of the Environment**

(Cross-listed with SOC). (3-0) Cr. 3.

*Prereq: 6 credits in sociology*

Social causes and social consequences of environmental problems. Interrelationship between social inequality and environmental inequality. Social construction and social experience of the environment. Contemporary developments in the social theory of the environment. International and domestic implications.

**SUSAG 571: Agroforestry Systems**

(Cross-listed with NREM). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: 6 credits in BIOL at 300 level or above*

Concepts of sustainable land use, agroecological dynamics, and component interactions of agroforestry systems. Agroforestry systems in temperate and tropical regions. Design and evaluation techniques for agroforestry systems. Ecological, socioeconomic and political aspects of agroforestry.

Meets International Perspectives Requirement.

**SUSAG 584: Organic Agricultural Theory and Practice**

(Cross-listed with AGRON, HORT). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: 9 credits in biological or physical sciences*

Understanding of the historical origins and ecological theories underpinning the practices involved in organic agriculture. Interdisciplinary examination of crop and livestock production and socioeconomic processes and policies in organic agriculture from researcher and producer perspectives.

**SUSAG 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Graduate classification, permission of instructor*

For students wishing to conduct in-depth study of a particular topic in sustainable agriculture.

**SUSAG 599: Creative Component**

Cr. arr. F.S.SS.

Pre-enrollment contract required. For MS students pursuing the non-thesis degree option. Final product is a creative component.

**Courses for graduate students:**

**SUSAG 600: Sustainable Agriculture Colloquium**

(1-0) Cr. 1. Repeatable. F.S.

Weekly seminar for graduate students in the Sustainable Agriculture program.

**SUSAG 610: Foundations of Sustainable Agriculture**

(Cross-listed with A B E, AGRON, ANTHR, SOC). (3-0) Cr. 3. F.

*Prereq: Graduate classification, permission of instructor*

Historical, biophysical, socioeconomic, and ethical dimensions of agricultural sustainability. Strategies for evaluating existing and emerging agricultural systems in terms of the core concepts of sustainability and their theoretical contexts.

**SUSAG 699: Research**

Cr. arr. Repeatable. F.S.SS.

MS and PhD thesis and dissertation research.

## Sustainable Environments (SUS E)

*Any experimental courses offered by SUS E can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**SUS E 501: Sustainable Design in Communities**

Cr. 5.

*Prereq: Graduate or senior status with instructor approval*

Exploring the challenges faced in implementing social, environmental, and economic sustainable solutions, this studio engages students in an interdisciplinary, team-oriented, and project-based learning environment through engagement with a Central Iowa community.

**SUS E 502: Sustainable Design Capstone Studio**

(0-12) Cr. 6.

*Prereq: Graduate or senior status with permission of instructor*

This advanced studio provides a community-based context for an interdisciplinary design team to work on a variety of self-directed, applied design research and intervention projects at multiple scales. Students utilize a common theoretical framework to organize their research and inform their interventions. Field trips.

**SUS E 511: Sustainable Design Colloquium I**

(3-0) Cr. 3.

*Prereq: Admission to MDSE program*

Study and discuss practices of sustainable design and design research. Investigate responsibilities, roles, technologies and methods for studying and advancing the art and science of designing sustainable environments.

**SUS E 512: Sustainable Design Seminar**

(1-0) Cr. 1.

*Prereq: Graduate standing or permission of instructor*

Students begin design research in sustainability issues by learning how to build a network of professional and academic contacts related to their individual research topics. Assignments include developing and engaging in an immersion experience related to their research.

**SUS E 513: Sustainable Design Research Writing**

(3-0) Cr. 3.

*Prereq: Graduate standing or permission of instructor*

Students develop a comprehensive and conclusive research manuscript for submission to a conference or journal in their discipline. SUS E student manuscripts detail their capstone projects. Non-majors compose papers detailing completed research projects in their own discipline.

**SUS E 521: Foundation of Sustainable Design**

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

Introduction to the broad frameworks and tools for implementing sustainability among a variety of environments, industries, and enterprises. Investigates the role and opportunity for sustainable design strategies.

**SUS E 531: Human Dimensions of Sustainability**

(3-0) Cr. 3.

*Prereq: Graduate or senior status or instructor permission*

This interdisciplinary seminar uses applied research with communities to ground students in the issues and conditions impacting social and economic sustainability. Students develop a broad understanding of community sustainability through weekly readings, discussions, and small made objects. Topics of focus include university-community partnerships, participatory design, and social constructions of sustainability.

**SUS E 540: Methods for Sustainable Design**

(3-0) Cr. 3. S.

*Prereq: senior or graduate standing.*

Overview of qualitative, quantitative and design research methods. In-depth application of methods relevant to capstone project proposal development (SUS E 502). Proposal must address research questions, articulation of research methods and preliminary findings grounded within contemporary theoretical discourse on Sustainable Environments.

**SUS E 550: Making Resilient Environments**

(Cross-listed with C R P). (3-0) Cr. 3. S.

*Prereq: senior or graduate standing.*

Major theories and ideas revolving around the concept of resilience. Assessing the social and political processes associated with policy making for resilience. Application of the concept of resilience in order to understand and evaluate environments. Evaluate the different approaches toward resilience and develop an understanding of the relationship between sustainability and resilience. Case studies of communities that proactively prepare for, absorb, recover from, and adapt to actual or potential future adverse events.

## Technology Systems Management (TSM)

**Any experimental courses offered by TSM can be found at:**

registrar.iastate.edu/faculty-staff/courses/explisting/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****TSM 110: Introduction to Technology**

(1-0) Cr. 1. F.

*Prereq: Agricultural Systems Technology or Industrial Technology major*

Team-oriented introduction to agricultural systems technology and industrial technology. Internships, careers, competencies, academic success strategies, transition to academic life.

**TSM 111: Experiencing Technology**

(1-0) Cr. 1. F.S.

*Prereq: Agricultural Systems Technology or Industrial Technology major*

Team-oriented experiences in a spectrum of topics common to the practice of technology. Internships, faculty and alumni panels, industry visits, and lab demonstrations.

**TSM 115: Solving Technology Problems**

(2-2) Cr. 3. F.S.

*Prereq: Credit or concurrent enrollment in MATH 140 or higher*

Solving technology problems using modern hardware and software tools for data-driven solutions. Problem solving cycle, unit conversion, unit factor method, SI and engineering units, significant figures, data collecting and cleaning, error analysis, data visualization, curve fitting, and computer coding fundamentals (data types, flow control, I/O handling, visualization, debugging). Strong emphasis on critical thinking, systematic problem solving, and effective communication.

**TSM 116: Introduction to Design in Technology**

(2-2) Cr. 3. F.S.

Use of parametric solid modeling software to create three dimensional solid models and document parts and assemblies. Includes national and international standards for documentation, design projects, and teamwork. Rapid prototyping design creation, 3D printing, assemblies, rendering, and detailing technical drawings.

**TSM 201: Preparing for Workplace Seminar**

(Cross-listed with A B E). (1-0) Cr. 1. F.S.

*Prereq: Major in AE, AST, BSE, or I TEC; Sophomore classification*

8 week course. Professionalism in the context of the engineering/technical workplace. Development of intrapersonal and interpersonal qualities including talent assessment; key workplace competency demonstration; leadership practice assessment; preparation of resume; cover letter preparation and behavioral-based interviewing; readiness for internship attainment.

**TSM 210: Fundamentals of Technology**

(3-0) Cr. 3. F.S.

*Prereq: (TSM 115, ENGR 160, A B E 160, AER E 160, C E 160, CH E 160, CPR E 185, E E 185, I E 148, M E 160, or S E 185); MATH 140 or higher*

Introduction to problem solving related to fundamental agricultural and/or industrial technology systems and mathematical tools needed for data analysis. Basic laws of energy, force, and mass applied to technology systems such as: mechanical power transmission; heating, ventilation and air conditioning; electrical circuits. Introduction to engineering economics: using the time value of money to make economic decisions.

**TSM 214: Managing Technology Projects**

(2-0) Cr. 1. F.S.

*Prereq: (A B E 201 or TSM 201); Sophomore classification*

8 week course. Introduction to project management principles. Use of project management in technology-based projects for academic, industry, and personal use.

**TSM 216: Advanced Technical Graphics, Interpretation, and CAD**

(1-2) Cr. 2. F.S.

*Prereq: TSM 116*

Advanced computer-aided-design topics incorporating 3D design and documentation used in manufacturing settings. Topics include: geometric dimensioning and tolerancing, weldments, sheet metal parts, advanced visualization, feature based design of parts and assemblies.

**TSM 240: Introduction to Advanced Manufacturing and Metals Processing**

(2-2) Cr. 3. F.S.

*Prereq: MATH 145*

A study of selected materials, properties, and related processes used in metals manufacturing including: CNC lathes, Aluminum die casting, and welding. Introduction to engineering economic tools and their use in financial decision making. Lecture and laboratory activities focus on metals manufacturing processes.

**TSM 241: Introduction to Manufacturing Processes for Plastics**

(Cross-listed with FS HN). (1-2) Cr. 2. F.S.

*Prereq: MATH 145*

A study of selected materials and related processes used in plastics manufacturing. Lecture and laboratory activities focus on materials, properties, and processes.

**TSM 270: Principles of Injury Prevention and Safety**

(3-0) Cr. 3. F.S.

Basic foundations of injury causation and prevention from a personal perspective in home, motor vehicle, and the public environment, and a management perspective within the work environment. Offered online only.

**TSM 310: Total Quality Improvement**

(3-0) Cr. 3. F.S.

*Prereq: (STAT 101 or STAT 104); Junior classification*

Introduction to the fundamental concepts of TQM - Deming style of management, statistical studies to understand the behavior of products, processes, or services, and how to define and document processes and customer focus. Introduction to continuous improvement tools and methods - emphasis on critical thinking and problem solving skills.

**TSM 322: Preservation of Grain Quality**

(3-0) Cr. 3. S.

*Prereq: MATH 140 or higher*

Principles and management for grain quality preservation: quality measurement; drying and storage; fans and airflow through grain; handling methods; insect pest control; and grain quality monitoring.

**TSM 322L: Preservation of Grain Quality Laboratory**

(0-3) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in TSM 322*

Hands-on experiences in the principles and management for grain quality preservation: Quality measurement; drying and storage; fans and airflow through grain; handling methods; system planning; insect pest control; grain quality monitoring. Industry tour.

**TSM 324: Soil and Water Conservation Management**

(2-2) Cr. 3. S.

*Prereq: MATH 140 or MATH 151*

Introduction to engineering and conservation principles applied to the planning of erosion control systems, water control structures, water quality management, and drainage and irrigation systems.

**TSM 325: Biorenewable Systems**

(Cross-listed with A B E). (3-0) Cr. 3. F.

*Prereq: CHEM 163 or higher; MATH 140 or higher*

Converting biorenewable resources into bioenergy and biobased products. Biorenewable concepts as they relate to drivers of change, feedstock production, processes, products, co-products, economics, and transportation/logistics.

**TSM 327: Livestock and Poultry Production: Facilities, Technology, and Management**

(2-2) Cr. 3. F.

Systems-based planning and assessment of confined livestock facilities. Housing evaluation, planning, and management of ventilation, water, and feed systems. Principles of nutrient management planning, manure handling/storage design. Evaluating animal responses to their environment with traditional metrics and precision livestock technologies to enhance welfare and production. Species-specific assessment of production economics, environmental impact, and sustainability.

**TSM 330: Agricultural Machinery and Power Management**

(2-3) Cr. 3. S.

*Prereq: (MATH 145 or MATH 151); TSM 210*

Selection, sizing, and operational principles of tractors and machinery systems. Cost analysis and computer techniques applied to planning and management of agricultural machine systems. Principles, operation, and application of agricultural machinery.

**TSM 335: Tractor Power**

(3-3) Cr. 4. F.

*Prereq: MATH 145; TSM 210*

Theory and construction of tractor engines, mechanical power trains and hydraulic systems. Introduction to traction, chassis mechanics, and hydraulic power.

**TSM 337: Fluid Power Systems Technology**

(2-2) Cr. 3. F.S.

*Prereq: TSM 210*

Fundamental fluid power principles, symbols and schematics. Function and performance of components such as pumps, valves, actuators, and hydro static transmissions. Analysis of fluid power circuits and systems. Introduction to electrohydraulics. Hands on laboratory experiences building and troubleshooting hydraulic circuits.



**TSM 340: Advanced Automated Manufacturing Processes**

(2-2) Cr. 3. F.S.

*Prereq: MATH 151; TSM 210; TSM 216; TSM 240*

NC programming operations and machining practices for CNC mills and lathes. Transfer of part descriptions into detailed process plans, tool selection, and NC codes. Use of CAD/CAM for automated NC programming in 2D/3D machining operations of student designed parts.

**TSM 363: Electrical Power and Control Systems for Agriculture and Industry**

(3-3) Cr. 4. F.S.

*Prereq: MATH 145; TSM 210*

Fundamental electrical theory and application, code requirements, and safety considerations. Single-phase, split-phase, and three-phase circuit design, analysis, and safety considerations; electric motor performance and selection; reactive power and correction; safety devices and circuits; transformer selection and configuration; industrial and motor controls; conductor characteristics, selection and safety; system troubleshooting; and schematic development and analysis. Emphasis on agricultural and industrial applications.

**TSM 370: Occupational Safety**

(3-0) Cr. 3. F.S.

*Prereq: TSM 270; Junior classification*

Identifies safety and health risks in industrial work environments. Focus on how managers and supervisors meet their responsibilities for providing a safe workplace for their employees. Includes the identification and remediation of workplace hazards.

**TSM 371: Occupational Safety Management**

(2-0) Cr. 2. S.

Introduction to occupational safety and health administration and management. Focus on development and management of safety programs and obtaining employee involvement in occupational safety programs.

**TSM 372: Legal Aspects of Occupational Safety and Health**

(2-0) Cr. 2. F.

*Prereq: TSM 371*

A review of the common legal issues facing safety practitioners in the workplace. Includes OSHA, EPA and DOT regulations; workers' compensation, as well as common liability issues.

**TSM 376: Fire Protection and Prevention**

(3-0) Cr. 3. F.

An overview of the current problems and technology in the fields of fire protection and fire prevention, with emphasis on industrial needs, focusing on the individual with industrial safety responsibilities.

**TSM 380: Fundamentals, Applications, and Modeling of Biological Systems**

(2-2) Cr. 3.

*Prereq: BIOL 212; MICRO 201*

Analysis of biological systems, through the study of mass, energy, and information transport in microbial, plant, animal, and human systems. Fundamentals, applications and modeling of biological processes, ecological interactions, and biomanufacturing operations.

**TSM 393: Topics in Technology**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393A: Topics in Technology: Agriculture and Biosystems Management**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393B: Topics in Technology: Machine Systems**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393C: Topics in Technology: Manufacturing**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393D: Topics in Technology: Occupational Safety**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393E: Topics in Technology: Chemical Application Systems**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393F: Topics in Technology: Agricultural Safety and Health**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393G: Topics in Technology: Electronic Integration for Agriculture and Production Systems**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393I: Topics in Technology: Irrigation Systems Management**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 393J: Topics in Technology: Machinery Management Using Precision Agriculture Technology**

Cr. 1-4. F.S.SS.

Offered as demand warrants. Web-based instruction.

**TSM 397: Summer Internship in Technology**

Cr. R. Repeatable. SS.

*Prereq: Sophomore or higher classification; AST or ITEC major; Permission of Instructor*

A supervised summer work experience in an approved learning setting with application to technology practices and principles. Written reports, self and employer evaluation, and reflection required. Minimum GPA requirement.

**TSM 399: Internship in Technology**

Cr. R. Repeatable. F.S.

*Prereq: At least 45 credits of coursework; AST or ITEC major; Approval of Internship Coordinator*

A supervised work experience that occurs during the fall or spring semester in an approved learning setting with application to technology practices and principles. Reporting during work experience, self and employer evaluation, and reflection required. Minimum GPA requirement.

**TSM 415: Applied Project Management in Technology**

(1-2) Cr. 2. F.S.

*Prereq: Senior classification; TSM 214; credit or concurrent enrollment in TSM 310*

Implementation of project management principles using case studies and teamwork; problem definition in a technology context; oral and written communication skills development; development of a charter for a technology capstone project.

**TSM 416: Technology Capstone**

(1-4) Cr. 3. F.S.

*Prereq: TSM 415*

Application of project management tools to a technology capstone project; development and evaluation of potential solutions using tools from the technology curriculum; problem resolution emphasizing communication, critical analysis, and planning techniques; presentation of project through oral presentation and written reports with input from client, faculty, and other stakeholders.

**TSM 433: Precision Agriculture**

(Dual-listed with TSM 533). (2-2) Cr. 3. F.

*Prereq: Junior classification*

Geographic information systems (GIS) and global positioning systems (GPS). Hardware systems for precision farming emphasized. Autosteering and automatic implement control systems. Collection and management of yield data. Sampling strategies for precision farming. Introduction to building fertilizer prescriptions and recommendations. Economic benefits of precision farming systems.

**TSM 440: Cellular Lean Manufacturing Systems**

(2-2) Cr. 3. F.S.

*Prereq: TSM 310*

Introduction to lean manufacturing tools and principles, which may include Just-In-Time (JIT), Value Stream Mapping (VSM), Kaizen, Single Minute Exchange of Die (SMED), 5S, Total Productive Maintenance, Standardized Work, Takt Time, and A3. Emphasis on minimizing waste and improving operational performance through tools such as Assembly Line Balancing, Little's Law, and Queuing Theory. Competency development through application using discrete event simulations, case studies, teamwork, industry-related lean projects, and industry guests.

**TSM 443: Statics and Strength of Materials for Technology**

(2-2) Cr. 3. F.S.

*Prereq: PHYS 131 or above; (MATH 145 or MATH 151)*

Application of standard analytic and computer based techniques of solving problems related to force and moments. The properties of materials and how to select appropriate materials for a particular design are reviewed.

**TSM 444: Facility Planning**

(3-0) Cr. 3. F.S.

*Prereq: (STAT 101 or STAT 104); TSM 216; TSM 240*

Fundamental principles and practices in designing, evaluating, and organizing new or existing facilities. Emphasis on AutoCAD-based facility design and production flow analysis, activity relationship analysis, lighting analysis, time studies, materials handling, supporting services design, and optimal facility location analysis.

**TSM 449: Applied Nondestructive Testing and Evaluation.**

(Dual-listed with TSM 549). (2-3) Cr. 3. F.

*Prereq: PHYS 131 or above; MATH 145; (MATH 151 or MATH 165)*

Scientific principles and rationale for non-destructive testing and evaluation. Assessment of material condition and detection of defects in manufacturing or in service. Testing methods and their application to agriculture and industry. Research project required for graduate credit.

**TSM 455: Feed Processing and Technology**

(Dual-listed with TSM 555). (2-3) Cr. 3. F.

*Prereq: Junior classification*

Introduction to formula feed manufacturing and the animal feed industry. Overview of feed ingredients and formulation, understanding and operation of feed production processing equipment including principles of conveying, grinding, mixing, conditioning, pelleting, and other processing techniques, and the formulation of concentrates, premixes, and rations. Students will become knowledgeable about the manufacturing of various animal feed types such as pelleted and extruded feed, aqua (fish) feed, liquid feeds, poured and pressed blocks, steam flaked feed, and pet food, and their effect on animal performance and health. Students will gain hands-on experience in feed manufacturing during weekly lab sessions at a full-scale university owned feed mill and grain science complex.

**TSM 457: Feed Safety, Ingredient Quality and Analytics**

(Dual-listed with TSM 557). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Concepts of feed and grain safety and quality, including hazards and risks associated with common feeds and feed ingredients. Methods to monitor, manage, and mitigate hazards and risks in the context of feed and grain industries. Government regulations applicable to feed and grain safety. Differences between safety and quality factors, how they are measured and then used for decision-making (marketing, processing, or safe-use).

**TSM 465: Automation Systems**

(2-2) Cr. 3. F.S.

*Prereq: TSM 363*

Theory and applications of automation systems. Emphasizes features, capabilities, design and programming skills of Programmable Logic Controller (PLC) based industrial control systems. Introduction to industrial robots and sensors.

**TSM 470: Industrial Hygiene: Physical, Chemical, and Biological Hazards**

(Dual-listed with TSM 570). (3-0) Cr. 3. S.

*Prereq: MATH 151 or higher*

A qualitative and quantitative introduction to health effects of chemical, biological, and physical hazards in a workplace.

**TSM 471: Safety Laboratory**

(Dual-listed with TSM 571). (0-2) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in TSM 470 or TSM 570*

Introduction to equipment, methods, and strategies to measure, evaluate, control, and research hazards and risk in the workplaces.

**TSM 477: Risk Analysis and Management**

(Dual-listed with TSM 577). (3-0) Cr. 3. F.

*Prereq: MATH 151; (STAT 101 or STAT 104)*

Risk analysis and management focuses on developing a risk oriented pattern of thinking that is appropriate for today's complex world. The tools that will be gained in this course will be helpful in recognizing, understanding, and analyzing hazards and risks in modern complex systems.

**TSM 490: Independent Study**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 490H: Independent Study: Honors**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 490I: Independent Study: Manufacturing**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 490J: Independent Study: Agriculture and Biosystems Management**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 490M: Independent Study: Machine Systems**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 490O: Independent Study: Occupational Safety**

Cr. 1-4. Repeatable.

*Prereq: Junior or Senior classification; Department Permission; Instructor Permission*

A maximum of 4 credits of TSM 490 may be used toward the total credits required for graduation.

**TSM 493: Workshop in Technology**

Cr. 1-4. Repeatable.

Offered as demand warrants.

**TSM 493A: Workshop in Technology: Agriculture and Biosystems Management**

Cr. 1-4. Repeatable.

Offered as demand warrants.

**TSM 493B: Workshop in Technology: Machine Systems**

Cr. 1-4. Repeatable.

Offered as demand warrants.

**TSM 493C: Workshop in Technology: Manufacturing**

Cr. 1-4. Repeatable.

Offered as demand warrants.

**TSM 493D: Workshop in Technology: Occupational Safety**

Cr. 1-4. Repeatable.

Offered as demand warrants.

**TSM 495: Agricultural and Biosystems Engineering Department Study Abroad Preparation or Follow-up**

(Cross-listed with A B E). Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Advisor Permission*

Preparation for, or follow-up of, study abroad experience (496). For preparation, course focuses on understanding the tour destination through readings, discussions, and research on topics such as the regional industries, climate, crops, culture, economics, food, geography, government, history, natural resources, and public policies. For follow-up, course focuses on presentations by students, report writing, and reflection. Students enrolled in this course intend to register for 496 the following term or have had taken 496 the previous term.

Meets International Perspectives Requirement.

**TSM 496: Agricultural and Biosystems Engineering Department Study Abroad**

(Cross-listed with A B E). Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Advisor Permission*

Tour and study at international sites relevant to disciplines of industrial technology, biological systems engineering, agricultural systems technology, and agricultural engineering. Location and duration of tours will vary. Trip expenses paid by students. Pre-trip preparation and/or post-trip reflection and reports arranged through 495.

Meets International Perspectives Requirement.

**Courses primarily for graduate students, open to qualified undergraduates:**

**TSM 533: Precision Agriculture**

(Dual-listed with TSM 433). (2-2) Cr. 3. F.

*Prereq: Junior classification*

Geographic information systems (GIS) and global positioning systems (GPS). Hardware systems for precision farming emphasized. Autosteering and automatic implement control systems. Collection and management of yield data. Sampling strategies for precision farming. Introduction to building fertilizer prescriptions and recommendations. Economic benefits of precision farming systems.

**TSM 540: Advanced Design and Manufacturing**

(3-0) Cr. 3. S.

*Prereq: Permission of instructor*

Application of manufacturing process improvement and control methodologies; exploration of advanced manufacturing strategies and equipment; function and operation of advanced automated manufacturing equipment including water jets, wire EDMs and 5-axis mills.

**TSM 549: Applied Nondestructive Testing and Evaluation.**

(Dual-listed with TSM 449). (2-3) Cr. 3. F.

*Prereq: PHYS 131 or above; MATH 145; (MATH 151 or MATH 165)*

Scientific principles and rationale for non-destructive testing and evaluation. Assessment of material condition and detection of defects in manufacturing or in service. Testing methods and their application to agriculture and industry. Research project required for graduate credit.

**TSM 555: Feed Processing and Technology**

(Dual-listed with TSM 455). (2-3) Cr. 3. F.

*Prereq: Junior classification*

Introduction to formula feed manufacturing and the animal feed industry. Overview of feed ingredients and formulation, understanding and operation of feed production processing equipment including principles of conveying, grinding, mixing, conditioning, pelleting, and other processing techniques, and the formulation of concentrates, premixes, and rations. Students will become knowledgeable about the manufacturing of various animal feed types such as pelleted and extruded feed, aqua (fish) feed, liquid feeds, poured and pressed blocks, steam flaked feed, and pet food, and their effect on animal performance and health. Students will gain hands-on experience in feed manufacturing during weekly lab sessions at a full-scale university owned feed mill and grain science complex.

**TSM 557: Feed Safety, Ingredient Quality and Analytics**

(Dual-listed with TSM 457). (2-3) Cr. 3. S.

*Prereq: Junior classification*

Concepts of feed and grain safety and quality, including hazards and risks associated with common feeds and feed ingredients. Methods to monitor, manage, and mitigate hazards and risks in the context of feed and grain industries. Government regulations applicable to feed and grain safety. Differences between safety and quality factors, how they are measured and then used for decision-making (marketing, processing, or safe-use).

**TSM 570: Industrial Hygiene: Physical, Chemical, and Biological Hazards**

(Dual-listed with TSM 470). (3-0) Cr. 3. S.

*Prereq: MATH 151 or higher*

A qualitative and quantitative introduction to health effects of chemical, biological, and physical hazards in a workplace.

**TSM 571: Safety Laboratory**

(Dual-listed with TSM 471). (0-2) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in TSM 470 or TSM 570*

Introduction to equipment, methods, and strategies to measure, evaluate, control, and research hazards and risk in the workplaces.

**TSM 575: Safety and Public Health Issues in Modern Society**

(2-0) Cr. 2. Repeatable, maximum of 2 times.

Exploration and analysis of current safety and public health issues impacting society. The focus will be on topics that impact individuals in work, public, and home environments.

**TSM 577: Risk Analysis and Management**

(Dual-listed with TSM 477). (3-0) Cr. 3. F.

*Prereq: MATH 151; (STAT 101 or STAT 104)*

Risk analysis and management focuses on developing a risk oriented pattern of thinking that is appropriate for today's complex world. The tools that will be gained in this course will be helpful in recognizing, understanding, and analyzing hazards and risks in modern complex systems.

**TSM 590: Special Topics in Technology**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Graduate classification in industrial and agricultural technology, permission of instructor, and completion of an independent study contract approved by major professor*

**TSM 590A: Special Topics in Technology: Agriculture and Biosystems Management**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Graduate classification in industrial and agricultural technology, permission of instructor, and completion of an independent study contract approved by major professor*

**TSM 590B: Special Topics in Technology: Machine Systems**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Graduate classification in industrial and agricultural technology, permission of instructor, and completion of an independent study contract approved by major professor*

**TSM 590C: Special Topics in Technology: Manufacturing**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Graduate classification in industrial and agricultural technology, permission of instructor, and completion of an independent study contract approved by major professor*

**TSM 590D: Special Topics in Technology: Occupational Safety**

Cr. 1-4. Repeatable, maximum of 4 credits.

*Prereq: Graduate classification in industrial and agricultural technology, permission of instructor, and completion of an independent study contract approved by major professor*

**TSM 593: Workshop in Technology**

Cr. 1-3. Repeatable.

*Prereq: Permission of instructor*

**TSM 599: Creative Component**

Cr. 1-3. Repeatable, maximum of 6 credits.

A discipline-related problem to be identified and completed under the direction of the program advisor. Three credits required for all nonthesis master's degree students.

**Courses for graduate students:**

**TSM 601: Graduate Seminar**

(Cross-listed with A B E). (1-0) Cr. 1. F.

Keys to starting a successful graduate research project. Effective literature review, formulating research questions, and setting goals. Practicing effectively communicating research and science. Effective strategies for scholarly writing, professional development, responding to feedback, peer-reviewing, successful publishing in journals, and curating scholarly output.

**TSM 652: Program and Learner Evaluation**

(3-0) Cr. 3.

*Prereq: STAT 587 or equivalent*

Techniques for evaluating learners, facilities, programs, and staff utilizing theories for developing measurement instruments. Outcomes assessment is emphasized.

**TSM 655: Academic Leadership in Technology and Engineering**

(3-0) Cr. 3.

*Prereq: Permission of instructor*

A discussion of faculty roles in technology and engineering disciplines, including strategies for dealing with programs, personnel, and constituencies. Leadership skills involving team formation, team operation, and conflict resolution are addressed. Emphasis is placed on the servant leadership model.

**TSM 657: Curriculum Development in Technology and Engineering**

(3-0) Cr. 3.

*Prereq: Permission of instructor*

Basic concepts, trends, practices, and factors influencing curriculum development, techniques, organization and procedures. Emphasis will be given to course development using the backward design process.

**TSM 694: Teaching Practicum**

(Cross-listed with A B E). Cr. 1-3. F.S.

*Prereq: Graduate classification and permission of instructor*

Graduate student experience in the agricultural and biosystems engineering departmental teaching programs.

**TSM 697: Internship in Technology**

Cr. R.

*Prereq: permission of major professor and approval by department chair, graduate classification*

One semester and one summer maximum per academic year professional work period. Offered on a satisfactory-fail basis only.

**TSM 699: Research**

Cr. arr.

## Theatre (THTRE)

***Any experimental courses offered by THTRE can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****THTRE 106: Introduction to the Performing Arts**

(3-0) Cr. 3. F.S.

An audience oriented, broad-based, survey of the performing arts which emphasizes theatre and includes segments on television, radio and podcasts, film, dance, music, and video games.

**THTRE 110: Theatre and Society**

(3-0) Cr. 3. F.S.

An introduction to Theatre focusing on its relationship with society throughout history.

**THTRE 151: Actor's Voice and Movement**

(3-0) Cr. 3. F.S.

Study, exploration, and practice of physical and vocal techniques that build expressiveness for the performing artist.

**THTRE 224: Concert and Theatre Dance**

(Cross-listed with DANCE). (0-3) Cr. 0.5-2. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Choreography, rehearsal, and performance in campus dance concerts and/or musical theatre productions. Offered on a satisfactory-fail basis only.

**THTRE 250: Technical Theatre Practicum**

Cr. 1-2. Repeatable, maximum of 6 credits. F.S.

*Prereq: Permission of Instructor*

Practice in various aspects of technical theatre production. Offered on a satisfactory-fail basis only.

**THTRE 251: Acting Foundations**

(3-0) Cr. 3. F.S.

Theory and practice in fundamentals of acting.

**THTRE 255: Introduction to Theatrical Production**

(3-3) Cr. 4. F.S.

Standard structure and procedures, historical overview of performing arts production including the design and creation of scenery, costumes and lighting.

**THTRE 263: Script Analysis**

(3-0) Cr. 3. F.S.

Theory, analysis, and interpretation of play scripts for production.

**THTRE 280: Special Topics**

Cr. 1-4. Repeatable, maximum of 12 credits.

Special topics in Theatre and Performing Arts.

**THTRE 290: Special Projects**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 3 credits in THTRE; Permission of Instructor***THTRE 301: Theatre Performance Practicum**

Cr. 1-3. Repeatable, maximum of 12 credits. F.S.

Study, rehearsal, and performance of fully produced theatrical works. Engage in staging, ensemble building, character analysis, and performance while participating in the process of mounting a fully realized theatrical production.



**THTRE 316: Creative Writing: Playwriting**

(Cross-listed with ENGL). (3-0) Cr. 3. S.

*Prereq: ENGL 250; Sophomore classification*

Progresses from production of scenes to fully developed one-act plays. Emphasis on action, staging, writing, analytical reading, workshop criticism, and individual conferences.

**THTRE 351: Acting: Contemporary Scene Study**

(3-0) Cr. 3. S.

*Prereq: (THTRE 251; THTRE 263) or Permission of Instructor*

Theory and practice of techniques of acting with emphasis on character, process, and scene analysis.

**THTRE 352: Puppetry Design and Performance**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

Through hands-on explorations of puppet design, construction, performance techniques and traditions, students will investigate the intersection of material, design, movement, and sound that is inherent in the art of puppetry.

**THTRE 353: Acting for the Camera**

Cr. 3. S.

Theory, practice, and exploration of acting on camera with particular focus on professional terms, techniques, and practical experience.

**THTRE 354: Musical Theatre History and Performance**

(2-2) Cr. 3.

*Prereq: THTRE 251 or Permission of Instructor*

Theory, history and practice of musical theatre. Designed to develop the musical theatre performance skills of singers, dancers, and actors.

**THTRE 355: Musical Theatre Auditions and Performance**

(2-2) Cr. 3.

*Prereq: THTRE 354 or Permission of Instructor*

Theory and practice of musical theatre audition and performance styles.

**THTRE 357: Stage Makeup**

(1-2) Cr. 2. S.

Introduction to the theory and practice of theatrical makeup techniques. Lab required.

**THTRE 358: Oral Interpretation**

(3-0) Cr. 3. F.S.

Principles of oral interpretation and storytelling, with practice in literary analysis and performance.

**THTRE 380: Special Topics**

Cr. 1-4. Repeatable, maximum of 12 credits.

Advanced topics in Theatre and Performing Arts.

**THTRE 393: Studies in Theatre Design and Production Workshop**

Cr. 3. Repeatable, maximum of 12 credits.

Studies in Theatre Design and Production. THTRE 255 recommended.

**THTRE 393A: Studies in Theatre Design and Production Workshop: Costume Design**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to costume design. THTRE 255 recommended.

**THTRE 393B: Studies in Theatre Design and Production Workshop: Scenic Design**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to scenic design. THTRE 255 recommended.

**THTRE 393C: Studies in Theatre Design and Production Workshop: Lighting Design**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics in lighting design. THTRE 255 recommended.

**THTRE 393D: Studies in Theatre Design and Production Workshop: Sound Design**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics in sound design. THTRE 255 recommended.

**THTRE 393E: Studies in Theatre Design and Production Workshop: Stagecraft**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics in stagecraft. THTRE 255 recommended.

**THTRE 393F: Studies in Theatre Design and Production Workshop: Costume Draping and Patterning**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics in costume draping and patterning. THTRE 255 recommended.

**THTRE 393G: Studies in Theatre Design and Production Workshop: Advanced Makeup**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to advanced makeup. THTRE 255 recommended.

**THTRE 393I: Studies in Theatre Design and Production Workshop: Stage Management**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to stage management. THTRE 255 recommended.

**THTRE 393J: Studies in Theatre Design and Production Workshop: Technical Direction**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to technical direction. THTRE 255 recommended.

**THTRE 393K: Studies in Theatre Design and Production Workshop: Arts Management**

Cr. 3. Repeatable, maximum of 12 credits.

Special topics related to Arts Management. THTRE 255 recommended.

**THTRE 393L: Studies in Theatre Design and Production Workshop: Scenic Painting**

(3-0) Cr. 3. Repeatable, maximum of 12 credits.

Studies and practice in scenic painting. THTRE 255 recommended.

**THTRE 393M: Studies in Theatre Design and Production Workshop: Costume Construction**

Cr. 3. Repeatable, maximum of 12 credits.

Studies and Practice in Costume Construction. THTRE 255 recommended.

**THTRE 451: Acting: Period Styles**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: (THTRE 251; THTRE 263) or Permission of Instructor*

Analysis and practice of period scenes.

**THTRE 455: Directing**

(3-0) Cr. 3. F.

*Prereq: (THTRE 255; THTRE 263) or Permission of Instructor*

Theory, techniques, and practice of directing. THTRE 251 recommended.

**THTRE 456: Advanced Directing**

(2-2) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: THTRE 455*

Advanced practical and theoretical exploration in directing.

**THTRE 465: Theatre History: Ancient to 19th Century**

(3-0) Cr. 3. F.

Theatre history from ancient times to the 19th Century. HIST 201 or equivalent recommended.

**THTRE 466: Theatre History: 19th Century to Present**

(3-0) Cr. 3. S.

Theatre history from 19th century to present. HIST 201 or equivalent recommended.

**THTRE 469: Advanced Technical Theatre Practicum**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: 9 credits in THTRE; Junior classification*

Practicum in production with ISU Theatre, with opportunities for specialization within various areas. Required: Approval of written proposal.

**THTRE 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits. F.S.SS.

*Prereq: 9 credits in THTRE; Junior classification; Department Permission*

Only one independent study enrollment within the department is permitted per semester. Approved written proposal required for enrollment. No more than 9 credits in Thtre 490 may be counted toward graduation.

**THTRE 499: Theatre Internship**

Cr. 1-8. Repeatable, maximum of 8 credits. F.S.SS.

*Prereq: 12 credits in THTRE; Department Permission*

Supervised application of theatre in professional settings.

**Courses primarily for graduate students, open to qualified undergraduates:**

**THTRE 504: Seminar**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 504A: Seminar: Musical Theatre**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 504B: Seminar: Acting Techniques**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 504C: Seminar: Acting Styles**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 504D: Seminar: Design and Technical Theatre**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 504E: Seminar: Arts Management**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: 9 credits in theatre*

Topics may include the following:.

**THTRE 590: Special Topics**

Cr. 1-4. Repeatable, maximum of 12 credits.

*Prereq: Approved written proposal*

# Toxicology (TOX)

**Any experimental courses offered by TOX can be found at:**

registrar.iastate.edu/faculty-staff/courses/explistsings/ (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for undergraduates:**

## TOX 354: General Pharmacology

(Dual-listed with TOX 554). (Cross-listed with B M S). (3-0) Cr. 3. S.

*Prereq: B M S 549 and B M S 552; BBMB 404, BBMB 405*

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

## TOX 401: Principles of Toxicology

(Dual-listed with TOX 501). (3-0) Cr. 3. F.

*Prereq: BBMB 404 or equivalent*

Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

## TOX 419: Foodborne Hazards

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: MICRO 201 or MICRO 302; 3 credits in BBMB*

Pathogenesis of human microbiological foodborne infections and intoxications, principles of toxicology, major classes of toxicants in the food supply, governmental regulation of foodborne hazards.

## TOX 420: Food Microbiology

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. F.

*Prereq: MICRO 201 or MICRO 302*

Effects of microbial growth in foods. Methods to control, detect, and enumerate microorganisms in food and water. Foodborne infections and intoxications.

## TOX 426: Veterinary Toxicology

(Dual-listed with TOX 526). (Cross-listed with VDPAM). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

## TOX 429: Foodborne Toxicants

(Dual-listed with TOX 529). (2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: A course in biochemistry*

Mechanisms of action, metabolism, sources, remediation or detoxification, risk assessment of major foodborne toxicants of current interest, design of HACCP plans for use in food industries targeting foodborne toxicants. Taught online only.

## TOX 450: Pesticides in the Environment

(Dual-listed with TOX 550). (Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

## TOX 490: Independent Study

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Independent study with a faculty mentor. Intended for students enrolled in the Pharmacology and Toxicology minor. Students in the Pharmacology and Toxicology minor may use no more than 9 credits of university-wide 490 credits towards the total of 120 credits required for graduation.

## TOX 499: Undergraduate Research

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.SS.

*Prereq: Permission of Instructor*

Independent research under faculty guidance. Intended for students enrolled in the Pharmacology and Toxicology minor. Offered on a satisfactory-fail basis only. Students may use no more than 9 credits of university-wide 499 credits towards the total of 120 credits required for graduation.

**Courses primarily for graduate students, open to qualified undergraduates:**

## TOX 501: Principles of Toxicology

(Dual-listed with TOX 401). (3-0) Cr. 3. F.

*Prereq: BBMB 404 or equivalent*

Principles of toxicology governing entry, fate, and effects of toxicants on living systems. Includes toxicokinetics and foreign compound metabolism relative to toxification or detoxification. Fundamentals of foreign compound effects on metabolism, physiology, and morphology of different cell types, tissues, and organ systems.

**TOX 502: Toxicology Methods**

(0-6) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: TOX 501*

Provides demonstrations or laboratory experience in the application of methods used in toxicology, including safety procedures, calculation and data analysis, teratologic and morphologic evaluation, cellular/molecular toxicological techniques, electrophysiologic measures, in vitro enzyme induction/biotransformation, neural and behavioral toxicology testing.

**TOX 504: Toxicology Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.SS.

*Prereq: Permission of instructor required*

Presentation of a seminar about a current topic in toxicology as part of a weekly series of seminars by graduate students, faculty, and guest lecturers from off campus. Graduate student speakers will meet with the instructor at least one week prior to their formal presentation.

**TOX 515: Regulatory Toxicology**

(2-0) Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: Graduate classification in the life or social sciences; undergraduate with permission of instructor.*

A survey course on risk analysis approaches used by toxicologists and other life and social scientists in government, industry and non-governmental organizations to inform regulatory policies and decisions under U.S. Federal statutes, including the Federal Food Drug and Cosmetic Act; the Food Quality Protection Act; the Federal Fungicide, Insecticide and Rodenticide Act; the Endangered Species Act; the Plant Protection Act; the National Environmental Policy Act; and the Toxic Substances Control Act. Topics covered include an overview of the roles and responsibilities of different U.S. Government Departments and Agencies in analyzing human; livestock and companion animal; and/or environmental risks and benefits of food products and food additives, cosmetics, drugs, pesticides, and consumer and industrial products.

**TOX 526: Veterinary Toxicology**

(Dual-listed with TOX 426). (Cross-listed with VDPAM). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**TOX 544: Aquatic Toxicology**

(2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Graduate student status.*

An overview of interactions between anthropogenic chemicals and aquatic ecosystems. Topics include history of aquatic toxicology, methods of toxicity testing, and species responses to toxicants. Emphasis is on aquatic pollutants of emerging concern (e.g., nanoparticles, microplastics).

**TOX 546: Clinical and Diagnostic Toxicology**

(Cross-listed with VDPAM). (0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: D.V.M. degree or VDPAM 526*

Advanced study of current problems and issues in veterinary toxicology. Emphasis on problem solving and interpreting clinical cases while utilizing clinical, epidemiological, and laboratory resources. Course consists highly of clinical case based material.

**TOX 550: Pesticides in the Environment**

(Dual-listed with TOX 450). (Cross-listed with ENT). (3-0) Cr. 3. S.

*Prereq: 6 credits of BIOL or Permission of Instructor*

Fate and significance of pesticides in soil, water, plants, animals, and the atmosphere.

**TOX 554: General Pharmacology**

(Dual-listed with TOX 354). (Cross-listed with B M S). (3-0) Cr. 3. S.

*Prereq: B M S 549 and B M S 552; BBMB 404, BBMB 405*

General principles; drug disposition; drugs acting on the nervous, cardiovascular, renal, gastrointestinal, and endocrine systems.

**TOX 565: Methods in Biostatistics and Epidemiology**

(Cross-listed with STAT). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 401 or STAT 500 or STAT 587; STAT 447 or STAT 543 or STAT 588*

Statistical methods commonly used in epidemiology and human and animal health studies. Overview of cohort studies, case-control studies and randomized clinical trials. Topics include inference procedures for disease risk factors, analysis of time-to-event and survival data, analysis of longitudinal studies of disease progression and health status, diagnostic test evaluation, and meta-analysis. Examples will come from recent studies of physical and mental health, nutrition and disease progression in human and animal populations. Use of statistical software: SAS or R.

**TOX 569: Reproductive and Developmental Toxicology**

(Cross-listed with AN S). Cr. 2. Alt. F., offered even-numbered years.

*Prereq: BBMB 301, BIOL 258 or An S 331*

Chemical agents that target developmental and reproductive systems in animals and humans, both male and female. The influence that timeline of developmental in utero and what part of reproductive organ have on outcome of environmental exposures will be developed. The physiological changes due to exposure, and mechanistic pathways activated by xenobiotics will be defined and the consequences of these changes will be explored.

**TOX 570: Risk Assessment for Food, Agriculture and Veterinary Medicine**

(Cross-listed with AGRON, VDPAM). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Statistics 300-level or higher.*

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

**TOX 575: Cell Biology**

(Cross-listed with B M S). (3-0) Cr. 3. F.

*Prereq: 10 credits in biological sciences and graduate student standing or permission of instructor*

A multi-instructor course covering major topics in cell structure and function, including: universal features of prokaryotic and eukaryotic cells, types of utilization and conversion of energy, genetic control of cell shape and functionality, internal organization of cells, communication between cells and their environment, development of multicellular systems. Students have to write a term paper.

**TOX 590: Special Topics**

Cr. arr. Repeatable.

Contact individual faculty for special projects or topics. Graded.

**Courses for graduate students:****TOX 626: Advanced Food Microbiology**

(Cross-listed with FS HN, MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Topics of current interest in food microbiology, including new foodborne pathogens, rapid identification methods, effect of food properties and new preservation techniques on microbial growth, and mode of action of antimicrobials.

**TOX 627: Rapid Methods in Food Microbiology**

(Cross-listed with FS HN, MICRO). (2-0) Cr. 2. Alt. F., offered even-numbered years.

*Prereq: FS HN 420 or FS HN 421 or FS HN 504*

Provides an overview of rapid microbial detection methods for use in foods. Topics include historical aspects of rapid microbial detection, basic categories of rapid tests (phenotypic, genotypic, whole cell, etc.), existing commercial test formats and kits, automation in testing, sample preparation and "next generation" testing formats now in development.

**TOX 656: Cellular and Molecular Pathology II**

(Cross-listed with V PTH). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of carcinogenesis.

**TOX 675: Insecticide Toxicology**

(Cross-listed with ENT). (2-3) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: ENT 555 or TOX 501*

Principles of insecticide toxicology; classification, mode of action, metabolism, and environmental effects of insecticides.

**TOX 689: Current Topics in Toxicology**

Cr. R. Repeatable. F.S.

Lecture and discussion participation on current topics in toxicology.

An 80% attendance is expected to satisfactorily complete the course.

Offered on a satisfactory-fail basis only.

**TOX 697: Graduate Research Rotation**

(0-12) Cr. 1-12. Repeatable, maximum of 3 times. F.S.SS.

*Prereq: Admission to Toxicology graduate program*

Graduate research projects performed under the supervision of selected faculty members in the graduate Toxicology major.

**TOX 699: Research**

Cr. arr. Repeatable. F.S.SS.

Research.

## Transportation (TRANS)

**Any experimental courses offered by TRANS can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**TRANS 599: Creative Component**

Cr. 1-3.

*Prereq: Pre-enrollment contract required*

Advanced topic for creative component report in lieu of thesis.

**Courses for graduate students:**

**TRANS 699: Research**

Cr. arr. Repeatable.

## U.S. Latino/a Studies Program (US LS)

*Any experimental courses offered by US LS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) ([http://](http://registrar.iastate.edu/faculty-staff/courses/explisting/)

[www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/))

**Courses primarily for undergraduates:**

### **US LS 211: Introduction to U.S. Latino/a Studies**

(3-0) Cr. 3. F.S.

History and current lives of the Latino/a peoples in the United States, including Mexican, Cuban, Puerto Rican, Dominican, and South and Central Americans, as well as information specific to Iowa Latino/as, will be covered. Through readings, class discussions, writing assignments, and guest speakers, students will acquire accurate information and a solid understanding of the US Latino/a population and cultural perspectives. Elements of Latino/a culture to be covered include historical, sociological, educational, psychological, economic, and political facets.

Meets U.S. Diversity Requirement

### **US LS 305: Spanish for Heritage Speakers**

(Cross-listed with SPAN). (3-0) Cr. 3. S.

*Prereq: Permission of Instructor*

Intensive study and application of grammar concepts in the development of writing and reading skills in a dynamic cultural context centered on Hispanics in the U.S. Designed for native or heritage Spanish speakers with oral proficiency in Spanish but with little or no formal academic training in the language. Taught exclusively in Spanish.

Meets U.S. Diversity Requirement

### **US LS 323: Topics in Latin American Anthropology**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

### **US LS 323A: Latin American Anthropology: Violence and Memory**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

### **US LS 323B: Latin American Anthropology: Social movements and Democracy**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

### **US LS 323C: Latin American Anthropology: Race, Class and Gender**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

### **US LS 323D: Latin American Anthropology: Regional Focus**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

S.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.

### **US LS 323E: Latin American Anthropology: Culture and Sport.**

(Cross-listed with ANTHR). (3-0) Cr. 3. Repeatable, maximum of 9 credits.

Exploration of key contemporary and historical issues in Latin American Anthropology; discussion of current anthropological approaches to studying Latin American social issues in a global context. Topics vary each time offered. ANTHR 201 or ANTHR 306 recommended.

Meets International Perspectives Requirement.



**US LS 325: Culture and Community: Iowa and Midwest Latino/as**

(Cross-listed with SPAN). (3-0) Cr. 3. S.

*Prereq: US LS 211*

Analysis and discussion of interdisciplinary texts examining the local and regional Latino/a immigration experience. Exploring Latino/a culture through participation in a community project. Assessed service learning component.

**US LS 343: Latin American Government and Politics**

(Cross-listed with POL S). (3-0) Cr. 3.

Political institutions, processes, and contemporary issues. Selected countries examined intensively to illustrate generalizations. Role of parties, military, church, human rights, women, environmental issues, interest groups, ideology, and globalization.

Meets International Perspectives Requirement.

**US LS 347: U.S. Latino/a Psychology**

(Cross-listed with PSYCH). (3-0) Cr. 3. S.

*Prereq: PSYCH 101; 1 additional PSYCH course*

Historical, political, and social contexts of psychological and mental health constructs in terms of their validity and utility for use with Latino/a people in the U.S. Unique aspects of psychological functioning particular to Latino/a people in the U.S.

Meets U.S. Diversity Requirement

**US LS 351: Introduction to Spanish-English Translation**

(Cross-listed with LING, SPAN). (3-0) Cr. 3. F.S.

*Prereq: SPAN 303A or SPAN 303B or SPAN 304*

Introduction to the theory, methods, techniques, and problems of translation. Consideration of material from business, literature, and the social sciences. Taught in Spanish.

Meets International Perspectives Requirement.

**US LS 360: Latinas and Victimization**

(Cross-listed with C J). (3-0) Cr. 3.

Intersections of race/ethnicity, class, gender, culture, acculturation, and immigration/migration in the victimization experiences of Latina women interacting with criminal justice systems and services. Topics include: domestic/intimate partner violence, sexual assault, human trafficking among Hispanic, Latina, and Chicana women, and the impact of language barriers, abuser threats of deportation, social and institutional discrimination and racism, cultural norms, and cultural insensitivity among first responders and service providers on help-seeking, well-being, and interactions with the criminal justice system.

**US LS 371: Mexican American History**

(Cross-listed with HIST). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

History of the Mexican American community in the U.S. from the 1820s to the present. Topics include community development, employment, social marginalization, racism/discrimination, depression and world wars, civil rights, ethnic power and politics.

Meets U.S. Diversity Requirement

**US LS 372: Latina/o History**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Historical and cultural heritage of Latinas/os in the United States. The histories of Mexican, Puerto Rican, Cuban, and other Latin American peoples in the U.S. emphasizing political and cultural convergence and congruencies.

Meets U.S. Diversity Requirement

**US LS 420: Bilingualism & The Education of Latinx Youth**

(Cross-listed with EDUC). (3-0) Cr. 3. F.

*Prereq: EDUC 405 or EDUC 406*

Introduction to research on bilingualism and examination of the social, historical, and political contexts of Spanish/English education in the U.S. Attention to policy environment, school program structure, mode of classroom instruction, family and community context, and attainment of bilingualism and biculturalism for Latinx youth.

Meets U.S. Diversity Requirement

**US LS 473: Civil Rights and Ethnic Power**

(Cross-listed with AF AM, HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

Comparative history of the civil rights and ethnic power movements (African American, Chicano, American Indian, Puerto Rican, among others) in the U.S. from World War II to the present. Topics include institutional foundations, leadership, gender and racial dynamics, and the convergences and divergences of these differing ethnic struggles for rights.

Meets U.S. Diversity Requirement

**US LS 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 9 credits.

*Prereq: Permission of Instructor*

Independent study under supervision of instructor. No more than 3 credits may count towards the U.S. Latino/a Studies certificate.

**US LS 499: Internship in US Latino/a Studies**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: US LS 211 and Permission of Instructor*

Supervised practice working with US Latino/a communities in the public or private sector, combined with academic work under faculty supervision. Offered on a satisfactory-fail basis only. Up to 3 credits may apply toward US LS minor.

## University Studies (U ST)

### ASSOCIATE PROVOST FOR ACADEMIC PROGRAMS

Certain interdisciplinary courses are offered through university studies, at the discretion of the associate provost for academic programs and upon the advice of the Faculty Senate Curriculum Committee. No major is available in university studies, but credit obtained through university studies offerings may be applied toward a degree in any of the colleges, consistent with the stipulations of the student's curriculum.

Requests to make use of U ST 290 and U ST 490 should be directed to the associate provost for academic programs and should be accompanied by a positive recommendation from the department chairs of the instructor(s) making the request.

***Any experimental courses offered by U ST can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:**

**U ST 101: First Year Seminar I**

(1-0) Cr. 1. F.S.

*Prereq: Acceptance/Participation in Hixson Scholars Program*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 101A: First Year Seminar I: Hixson Scholars**

(1-0) Cr. 1. F.S.

*Prereq: Acceptance/Participation in Hixson Scholars Program*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 101B: First Year Seminar I: MVP Award**

(1-0) Cr. 1. F.S.

*Prereq: Acceptance/Participation in Multicultural Vision Program*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 101C: First Year Seminar I: Science Bound**

(1-0) Cr. 1. F.S.

*Prereq: Acceptance/Participation in Science Bound Program*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 101D: First Year Seminar I: Student Athlete Experience**

(1-0) Cr. 1. F.S.

*Prereq: Acceptance/Participation in Student Athlete Experience*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 101F: First Year Seminar I: Academic Program for Excellence (APEX)**

Cr. 1. F.SS.

*Prereq: Acceptance/Participation in Academic Program for Excellence (APEX)*

Orientation to the university focusing on student transition, acclimation to university, exposure to campus resources, and student success strategies. Exploration of topical issues associated with specific learning community or program focus. Offered on a satisfactory-fail basis only.

**U ST 102: First Year Seminar II**

(1-0) Cr. 1. S.

*Prereq: U ST 101*

Acceptance/participation in appropriate learning community. Continued exploration of university services, strategies for student success, leadership, and acclimation to university. Exploration of issues associated with learning community focus. Offered on a satisfactory-fail basis only.

**U ST 102A: First Year Seminar II: MVP Award**

(1-0) Cr. 1. S.

*Prereq: U ST 101*

Acceptance/participation in appropriate learning community. Continued exploration of university services, strategies for student success, leadership, and acclimation to university. Exploration of issues associated with learning community focus. Offered on a satisfactory-fail basis only.

**U ST 102B: First Year Seminar II: Science Bound**

(1-0) Cr. 1. S.

*Prereq: U ST 101*

Acceptance/participation in appropriate learning community. Continued exploration of university services, strategies for student success, leadership, and acclimation to university. Exploration of issues associated with learning community focus. Offered on a satisfactory-fail basis only.

**U ST 104: Personal Career Development**

(2-0) Cr. 2. F.S.

Comprehensive approach to personal career development providing students with the skills and structure to make informed choices about their major and career path. Self-exploration of interests, skills, values, and personality as related to the world of work using a variety of techniques; exploration of majors and occupations; model for major and career decision-making and career goal implementation; exposure to effective job search and interviewing skills and resources.

**U ST 105: Carver Academy Seminar: Freshmen**

(1-0) Cr. 1. F.

*Prereq: George Washington Carver Scholarship Recipient*

Orientation to the university for Carver Academy students focusing primarily on transition and acclimation to the university environment. Individual and group identity development. Life and legacy of George Washington Carver. Offered on a satisfactory-fail basis only.

**U ST 106: Carver Academy Seminar: Freshmen**

(1-0) Cr. 1. S.

*Prereq: George Washington Carver Scholarship Recipient*

Introduction for Carver Academy students to resources at ISU to supplement classroom learning. Exploration of multicultural communities and leadership opportunities at ISU. Offered on a satisfactory-fail basis only.

**U ST 110: International First-Year Experience Seminar**

(1-0) Cr. 1. F.S.

Topics to help international students transition to the United States and academic culture including, but not limited to, culture shock, classroom culture, campus and community resources, learning styles, study skills, U.S. laws and safety, and student health and wellness. Offered on a satisfactory-fail basis only.

**U ST 205: GWC/MVP Scholar Seminar**

(1-0) Cr. 1. F.

*Prereq: U ST 106 or U ST 102A*

Leadership is often defined by the positional leadership office(s) that an individual holds. Leadership may also be defined by the recognition an individual may attain from the office(s) one holds. While these definitions exist, there are also other aspects to the meaning of leadership. Through this semester-long seminar course, students will further explore the definition(s) of leadership. Through the various course activities, students will discover leadership through the lens of actively bettering one's environment and being a positive agent of social change. Offered on a satisfactory-fail basis only.

**U ST 207: Science Bound Pre-Professional Seminar**

(1-0) Cr. 1. Repeatable, maximum of 2 credits. F.S.

*Prereq: U ST 102B*

Seminar topics prepare sophomore and upper-class students to pursue research and internship experiences in science, technology, engineering and math fields. Offered on a satisfactory-fail basis only.

**U ST 290: Independent Study**

Cr. arr.

*Prereq: Permission of Instructor*

Independent study on topics of an interdisciplinary nature. Intended primarily for freshmen and sophomores.

**U ST 301: McNair Program: Introduction to Research I**

(2-0) Cr. 2. F.

*Prereq: Acceptance in McNair Scholar Program*

Introduction to academic research focusing on the initial stages of research with lessons on how to define a research idea, formulate a research question or hypothesis, gather, critique, analyze and synthesize the literature on the subject of inquiry, and understand and be able to apply a number of methodologies to gather data.

**U ST 302: McNair Program: Introduction to Research II**

(2-0) Cr. 2. S.

*Prereq: U ST 301*

Continuation of research preparation focusing on methodologies and the relevance to specific research questions, data collection and analysis processes, and scientific research writing and presentation. Lessons on how to determine appropriate methodology and design a scientific protocol, gather and analyze data, and understand findings so as to effectively report and present findings and conclusions.

**U ST 303: CALM Life Skills Seminar**

(1-0) Cr. 1. F.S.

*Prereq: U ST 101D*

CALM After the Storm is a course designed to assist student-athletes successfully transition to life after Iowa State University and collegiate athletics. Topics include career preparation, adulthood, life after athletics, and money management. Offered on a satisfactory-fail basis only.

**U ST 311: Leaders Seminar I**

(1-0) Cr. 1. Repeatable.

*Prereq: Acceptance/Participation in Hixson Scholars Program*

For students serving as peer mentor first-year seminar leaders under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 311A: Leaders Seminar I: Leaders in Hixson Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: Acceptance/Participation in Hixson Scholars Program*

For students serving as peer mentor first-year seminar leaders under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 311B: Leaders Seminar I: Leaders in MVP Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: Acceptance/Participation in Hixson Scholars Program*

For students serving as peer mentor first-year seminar leaders under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 312: Leaders Seminar II**

(1-0) Cr. 1. Repeatable.

*Prereq: U ST 311*

For students serving as leaders in Hixson Seminar or MVP Seminar under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 312A: Leaders Seminar II: Leaders in Hixson Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: U ST 311*

For students serving as leaders in Hixson Seminar or MVP Seminar under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 312B: Leaders Seminar II: Leaders in MVP Seminar**

(1-0) Cr. 1. Repeatable.

*Prereq: U ST 311*

For students serving as leaders in Hixson Seminar or MVP Seminar under faculty supervision. Development of course facilitation and peer leadership skills. Offered on a satisfactory-fail basis only.

**U ST 315: Cyclone Aide Leaders Seminar**

(3-0) Cr. 2. Repeatable, maximum of 4 credits. S.

*Prereq: Selection as Cyclone Aide or Cyclone Aide Advisor*

Development of public speaking, group facilitation, and peer leadership skills. Exploration of issues associated with student transition to college, university organizational structures, and processes associated with student matriculation. Offered on a satisfactory-fail basis only.

**U ST 316: Leadership in Peer Education**

Cr. 2. S.

Provides emerging student leaders, preparing to be peer educators or peer mentors, with an understanding of peer education. Introduction to foundational theories of peer education and behavior change, connect their learning to previous experiences, and apply their learning to practice various peer education skills. Learn and practice essential peer education skills including effective listening, responding and referral, small group facilitation & dialogue, and developing inclusive environments. Offered on a satisfactory-fail basis only.

**U ST 321: NCORE Scholars: Race and Ethnicity in the U.S**

(2-2) Cr. 3. F.

*Prereq: Selection as an NCORE Student Scholar*

Exploration and research related to the impact of race and ethnicity on social, economic, and political aspects of our society, as well as personal identity development.

**U ST 401: McNair Senior Seminar I**

(1-0) Cr. 1. F.

*Prereq: U ST 301*

Comprehensive approach to choosing and applying to graduate school including drafting and finalizing the personal and research essay, understanding graduate funding, preparing for the grad interview, standardized exam preparation, and conversations with faculty and graduate students. Offered on a satisfactory-fail basis only.

**U ST 402: McNair Senior Seminar II**

(1-0) Cr. 1. S.

*Prereq: U ST 401*

Continuation of graduate school preparation focusing on transitioning, navigating the critical first year, succeeding in graduate school through to the completion of the PhD, and conversations with faculty and graduate students. Offered on a satisfactory-fail basis only.

**U ST 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Independent study on topics of an interdisciplinary nature. Intended primarily for juniors and seniors.

# Urban Design (URB D)

**Any experimental courses offered by URB D can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

## URB D 501: Urban Design Local Studio

(3-6) Cr. 6.

*Prereq: Graduate standing or senior classification with instructor permission*

Analysis and observation of urban morphology, culture, and infrastructure through urban design projects set in Midwestern cities. Students learn, interpret, and propose design interventions to address urban challenges related to changing socio-political, economic, and environmental contexts. Field trips.

## URB D 502: Urban Design Global Studio

(1-10) Cr. 6.

*Prereq: Graduate standing or senior classification with instructor permission.*

Students develop proposals for urban design interventions in an international context at multiple scales using investigation, analysis, observation, and interaction. Field trips.

## URB D 511: North American Urbanization

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission*

Focus on the historical role of planning and urban design in the shaping of North American cities and regions, from the colonial period to the late twentieth century. Examine the legacy of planning and design by exploring the intersection of geographic space, politics, and policy. Investigate the factors and the processes that produce the built environment.

## URB D 512: Urban Design Colloquium

Cr. R. Repeatable.

*Prereq: enrollment in the Urban Design program*

Special topics and guest speakers. Offered on a satisfactory-fail basis only.

## URB D 513: Urbanism Research

Cr. 3.

*Prereq: Urb D 502*

Research expands and integrates discourse and design findings from various Urban Design degree courses. Students develop independently-defined research to produce a comprehensive and conclusive final document that incorporates text, visuals and/or other media.

## URB D 521: Foundations of Urban Design

(3-0) Cr. 3.

*Prereq: Graduate standing, senior classification with instructor permission.*

Introduction to the ways that urban designers think about the city with a focus on how history, theory, and a wide range of contextual factors inform urban design practice. Field trip.

## URB D 522: Contemporary Urban Design Practices

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

Study of emerging trends and practices in urban design using a range of current media communication platforms. Course will be conducted in a combination of lecture, seminar formats. Graduate level readings, discussions, research, and development of projective scenarios.

## URB D 531: Methods of Urban Design Workshop

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

An exploration of contemporary urban design methods derived from significant urban projects and (re)development initiatives. Selected case studies to articulate and evaluate methods for implementing urban design goals and objectives in a variety of urbanized contexts. Case studies will build on a combination of analytical research, lectures, student presentations, and field trips.

## URB D 532: Urban Design Media Workshop

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

An introduction to visual representation tools and techniques for generating and communicating urban design concepts, processes, and analytics. Project and exercises utilize traditional and contemporary approaches to drawing, modeling, and mapping, as well as desktop publishing tools.

## URB D 533: Urbanism Theory and Methods

(3-0) Cr. 3.

*Prereq: Graduate standing or senior classification with instructor permission.*

This course examines how socio-political and economic forces shape the contemporary built environment. The course highlights various methods urban designers use to affect change and, in turn, how these impact stakeholders and communities. Students develop critical awareness of the impact of their decision making on the city.

# Veterinary Clinical Sciences (V C S)

**Any experimental courses offered by V C S can be found at:**

[registrar.iastate.edu/faculty-staff/courses/explistsings/](http://registrar.iastate.edu/faculty-staff/courses/explistsings/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explistsings/>)

**Courses primarily for professional curriculum students:**

**V C S 305: Shelter Medicine**

Cr. 1. S.

*Prereq: Vet Med Classification*

An elective course designed to educate the veterinary student about issues of relevance to companion animal population and shelter medicine and welfare.

**V C S 311: Veterinarian in Society I**

Cr. R. F.

*Prereq: Vet Med Classification*

Introduction to the veterinary profession and the various career opportunities available.

**V C S 313: Veterinarian in Society III**

(1-1) Cr. 1. F.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. The course covers selected topics on moral and ethical issues affecting the practice of veterinary medicine. Offered on a satisfactory-fail basis only.

**V C S 314: Veterinarian in Society IV**

(1-0) Cr. 1. F.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. This course will focus on helping students develop their communication, leadership, team building and conflict resolution skills.

**V C S 315: Veterinarian in Society V**

(1-0) Cr. 1. S.

*Prereq: Vet Med Classification*

A continuation of the Veterinarian in Society series. This course will emphasize veterinary law. Offered on a satisfactory-fail basis only.

**V C S 318: Advanced Small Animal Oncology**

Cr. 1. S.

*Prereq: Vet Med 3 Classification; V C S 444*

Provide advanced instruction in medical oncology, radiation oncology, and surgical oncology. General learning objectives include demonstrating the ability to utilize information from the physical exam and historical findings to direct appropriate diagnostics and staging based on a specific cancer diagnosis. Offered on a satisfactory-fail basis only.

**V C S 339: Clinical Foundations I**

(Cross-listed with B M S). (0-2) Cr. 1. F.

*Prereq: First-year classification in veterinary medicine*

Canine physical examination; basic behavior, animal handling and restraint; medical record keeping.

**V C S 385: Grand Rounds**

Cr. R. Repeatable. F.S.

*Prereq: Vet Med Classification*

Seminars and case presentations on selected clinical subjects by fourth-year students of the College of Veterinary Medicine. Attendance is required for a passing grade. Offered on a satisfactory-fail basis only.

**V C S 391: Clinical Imaging**

(1-0) Cr. 1. F.

*Prereq: Vet Med Classification*

Evaluation of morphologic anatomy of the dog and cat utilizing clinical imaging methods - radiography, ultrasonography, computed tomography, magnetic resonance imaging and nuclear imaging. Emphasis will be placed on normal radiographic anatomy.

**V C S 393: Principles of Surgery**

(2-2) Cr. 3. F.

*Prereq: Vet Med Classification*

General principles of surgery of companion animals.

**V C S 394: Principles of Surgery Laboratory**

(0-3) Cr. 1. S.

*Prereq: Vet Med Classification*

General principles of surgery of companion animals.

**V C S 395: Small Animal Surgery**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

Small animal surgery.

**V C S 396: Fundamentals in Equine Practice**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

This elective course is an introduction and overview of the clinical aspects of common conditions in horses and related conditions, including pathogenesis, clinical manifestations, diagnosis, treatment and prognosis. It is not designed to teach the student how to perform specific procedures, but rather to improve knowledge base of students interested in equine or mixed animal practice. Class will include lecture, photos, video presentations, and other formats.

**V C S 398: Anesthesiology**

(2-0) Cr. 2. S.

*Prereq: Vet Med Classification*

Anesthetic equipment, agents and procedures, including pain management for core species.

**V C S 399: Ophthalmology**

(1-0) Cr. 1. S.

*Prereq: Vet Med Classification*

Principles and techniques of medical and surgical ophthalmology.



**V C S 402: Clinical Cardiology I**

(1-0) Cr. 1. F.

*Prereq: Vet Med 3 or 4 Classification*

Elective course in diagnosis and management of cardiac diseases.  
Emphasis on interpretation of electrocardiography.

**V C S 403: Clinical Cardiology II**

Cr. 1. S.

*Prereq: Vet Med 3 Classification*

Elective course in clinical cardiology. Emphasis on common congenital and acquired cardiac diseases of companion animals. Builds on foundation of basic clinical cardiac knowledge obtained in V C S 444; expands to cover additional diseases in greater depth (e.g. infective endocarditis, systemic and pulmonary hypertension, heartworm disease, feline arterial thromboembolism, bradyarrhythmias and cardiac pacing, congenital heart diseases and interventional correction). Offered on a satisfactory-fail basis only.

**V C S 404: Topics in Emergency and Critical Care**

Cr. 2. S.

*Prereq: Vet Med 3 Classification*

Introduction of common topics in emergency and critical care in companion animals. General learning goals for students in this course include developing the ability to utilize physical exam skills and historical findings to triage patients and assess stability.

**V C S 405: Pet Bird and Exotic Species Medicine**

(1-3) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

Elective course in management and diseases of pet birds and exotic species.

**V C S 406: Introduction to Captive Wild Animal Medicine**

Cr. 1. S.

*Prereq: Vet Med 3 Classification*

Topics covering the health and welfare of non-domestic animals in captivity. Regulations specific to exotic animal ownership and exhibition will be covered. Students will discuss diseases which affect multiple taxon groups, and learn about interface diseases. Specific topics regarding the veterinary care of exotic canids, felids, ungulates, primates, Old-World Camelids, exotic equids and avian species will be discussed. Laboratories will introduce remote-delivery and restraint devices, dangerous animal handling techniques (including venomous snake handling techniques), contraception for non-domestic animals, and extra-label use of medications and vaccines in non-domestic species.

**V C S 407: Feline Internal Medicine**

(1-0) Cr. 1. F.

*Prereq: Vet Med 3 Classification*

Elective course in feline internal medicine.

**V C S 409: Oncology**

Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in oncology.

**V C S 414: Companion Animal Nutrition**

(1-0) Cr. 1. S.

*Prereq: Vet Med 3 or 4 Classification*

Elective course in small animal and equine nutrition.

**V C S 415: Advanced Small Animal Dermatology**

(1-2) Cr. 2. F.S.

*Prereq: Vet Med 4 Classification*

Elective course in dermatology. Offered on a satisfactory-fail basis only.

**V C S 419: Preceptorship in Companion Animal/Equine Veterinary Medical Practice**

Cr. 2-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Vet Med 4 Classification*

Elective course in veterinary practice under the guidance of veterinarians in approved practice settings. Maximum of 6 credits in 2 credit increments. Instructor Permission needed if not a VM4 classification.

**V C S 420: Practicum**

Cr. R. Repeatable.

*Prereq: Vet Med 4 Classification*

External practical experiences in the fourth year curriculum for additional professional development of the veterinary student. Instructor Permission needed if not a WM4 classification. Offered on a satisfactory-fail basis only.

**V C S 423: Zoo Preceptorship**

Cr. 2-12. Repeatable, maximum of 12 credits. F.S.SS.

*Prereq: (V C S 405 or V C S 406); Permission of Instructor*

Elective course in veterinary practice under the guidance of trained zoo veterinarians in approved practice settings. Maximum of 12 credits.

**V C S 436: Small Animal Internal Medicine**

(3-0) Cr. 3. F.

*Prereq: Vet Med 3 Classification*

Clinical diagnosis and treatment of diseases of small animals.

**V C S 437: Small Animal Shelter Medicine**

(2-0) Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

A 2-week elective rotation at an animal shelter/humane society that works with the public to place pets in homes. This rotation will encompass population medicine (medicine, surgery, intake, adoption, behavior and temperament, neglect and cruelty) that animal shelters deal with on a daily basis. The selected animal shelter/humane society must have a veterinarian(s) on staff and be approved by the course coordinator. More than one VCS 437 may be taken upon approval of the course coordinator.

**V C S 440: Introduction to Clinics**

Cr. R. S.

*Prereq: Vet Med Classification*

Rotating assignments through multiple sections within the Veterinary Medical Center.

**V C S 441: Canine Rehabilitation**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in rehabilitation.

**V C S 443: Equine Lameness**

(1-2) Cr. 2. S.

*Prereq: Vet Med 2 or 3 Classification*

Orthopedic diseases of the equine.

**V C S 444: Small Animal Medicine**

(4-0) Cr. 4. F.S.

*Prereq: Vet Med Classification*

Clinical diagnosis and treatment of diseases of small animals.

**V C S 445: Equine Medicine**

(2-0) Cr. 2. F.

*Prereq: Vet Med Classification*

Clinical diagnosis and treatment of diseases of equine.

**V C S 446: Clinical Neurology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical rotation in neurology with an emphasis on neurolocalization, disease processes, use of diagnostics in medical and surgical neurology and treatment options. Exposure to neurosurgical techniques.

**V C S 447: Equine Veterinary Diagnostic Skills**

(3-0) Cr. 2. S.

*Prereq: Vet Med 4 Classification*

Hands on experience with equine veterinary diagnostic skills related to theriogenology, medicine, surgery, radiology, and ophthalmology. Preference to equine track student.

**V C S 448: Diagnostic Imaging and Radiobiology**

(2-2) Cr. 3. F.S.

*Prereq: Vet Med Classification*

Essentials of diagnostic image interpretation. Essentials of radiobiology, radiation therapy and protection from radiation.

**V C S 449: Junior Surgery Laboratory**

(1-6) Cr. 3. F.

Pre-laboratory presentations and laboratories introduce the student to anesthetic and surgical principles and techniques that can be applied to all animal species.

**V C S 449B: Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 3. F.

*Prereq: Vet Med Classification*

This laboratory introduces the student to anesthetic and surgical principles and techniques that can be applied to all animal species. Provides a broader range of surgical experiences throughout the laboratory.

**V C S 451: Advanced Junior Surgery Laboratory**

(1-6) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species.

**V C S 451B: Advanced Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 2. Repeatable. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species. Exposure to more advanced surgical techniques with most surgical principles.

**V C S 451C: Advanced Junior Surgery Laboratory: Traditional Curriculum**

(1-6) Cr. 2. S.

*Prereq: Vet Med 3 Classification*

8 weeks. Continuation of surgical laboratory experience. Techniques and advanced principles learned are applicable to all animal species. A second repeat for students with a special interest in small animal surgery.

**V C S 452: Clinical Dermatology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Study of clinical dermatological problems via computer-aided instruction, case simulations, and/or lectures. Clinical management of cases presented to Veterinary Medical Center. Instructor Permission needed if not a VM4 classification.

**V C S 453: Small Animal Medicine I**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in small animal medicine.

**V C S 455: Small Animal Soft Tissue Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in soft tissue surgery.

**V C S 456: Small Animal Orthopedic Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in orthopedic surgery.

**V C S 457: Equine Medicine**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine medicine.

**V C S 458: Equine Surgery**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine surgery.

**V C S 459: Small Animal Overpopulation Medicine and Surgery**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459A: Small Animal Overpopulation Medicine and Surgery :Nebraska Humane Society, Omaha NE**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459C: Small Animal Overpopulation Medicine and Surgery: WaySide Waifs, Kansas City MO**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459D: Small Animal Overpopulation Medicine and Surgery: Boulder Humane Society, Boulder, CO**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 459E: Small Animal Overpopulation Medicine and Surgery: ASPCA Spay/Neuter Alliance, Ashville, NC**

Cr. 2.

*Prereq: Vet Med 4 Classification*

A 2-week surgical emphasis, elective rotation at a humane society that addresses the issues facing veterinarians and non-veterinary humane society personnel who deal with small animal overpopulation issues. Each section can be taken for credit once.

**V C S 460: Radiology**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Clinical assignment in veterinary radiology.

**V C S 463: Primary Care**

Cr. 2. Repeatable, maximum of 4 credits.

*Prereq: Vet Med 4 Classification*

Clinical experience in hospital based general practice.

**V C S 464: Equine Field Services**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Clinical assignment in equine ambulatory practice.

**V C S 465: Farrier**

Cr. 2.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment on the principles and practices of normal and therapeutic horseshoeing and equine foot care.

**V C S 466: Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in small animal and large animal anesthesiology.

**V C S 468: Intensive Care**

Cr. 4. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment to provide supervision of hospital cases requiring intensive care and including emergency cases.

**V C S 469: Ophthalmology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Clinical assignment in ophthalmology.

**V C S 475: Cardiology Rotation**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in cardiology.

**V C S 476: Veterinary Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology.

Experience includes case work-up, management and recovery.

Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.

**V C S 476E: Equine Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology.

Experience includes case work-up, management and recovery.

Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.

**V C S 476S: Small Animal Anesthesiology**

Cr. 2. Repeatable.

*Prereq: Vet Med 4 Classification*

Assignments in equine, small animal, and large animal anesthesiology.

Experience includes case work-up, management and recovery.

Understanding of the unique physiology and potential complications of anesthetized patients. Pharmacology of commonly used drugs. Specific protocols and management for both field and general anesthesia.

**V C S 478: Intensive and Critical Care**

(2-0) Cr. 2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Vet Med 4 Classification*

Elective clinical assignment in intensive care.

**V C S 480: Veterinary Dentistry**

Cr. 1. F.

*Prereq: Vet Med 3 or 4 Classification*

All aspects of veterinary dentistry, prophylaxis, endodontics, and orthodontics. This course is an on-line course. Offered on a satisfactory-fail basis only.

**V C S 481: Advanced Equine Dentistry**

Cr. 2. S.

*Prereq: Vet Med 4 Classification*

Clinical rotation in equine dentistry with an emphasis on routine equine dental examinations, specialized equipment, and corrective procedures. Offered only offered for one 2-week rotation. Enrollment is limited.

**V C S 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Independent Study in veterinary medicine focusing on basic / translational research or learning issues. Enrollment in this course is not appropriate for clinical experiences in the Veterinary Medical Center or extramural experiences in clinical veterinary practice (i.e., preceptorships).

**V C S 492: Orientation for International Experience**

(2-0) Cr. 1. Repeatable. S.

*Prereq: Vet Med Classification*

8 weeks. Predeparture orientation for group study abroad. Cultural considerations for the study abroad experience and a conversational language introduction. Out of class work may be assigned.

**V C S 495: Grand Rounds Presentations**

Cr. R. S.

*Prereq: Vet Med 4 Classification*

Seminars and case presentations on selected subjects by fourth year students of the College of Veterinary Medicine. Completion of a seminar presentation is required for graduation. Offered on a satisfactory-fail basis only.

**V C S 496: International Experience**

Cr. 1-12. Repeatable.

*Prereq: Vet Med Classification*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**V C S 590: Special Topics**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590A: Special Topics: Medicine**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590B: Special Topics: Surgery**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590C: Special Topics: Theriogenology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590D: Special Topics: Radiology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590E: Special Topics: Anesthesiology**

Cr. 1-3. Repeatable.

*Prereq: Permission of Instructor*

**V C S 590F: Special Topics - Ophthalmology**

Cr. 1-3. Repeatable, maximum of 3 credits. F.S.

*Prereq: Permission of Instructor*

Special topics in Ophthalmology.

**V C S 596: International Preceptorship**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Admission to Graduate college*

International Preceptorships and Study Abroad Group programs. Provides opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**V C S 599: Creative Component**

Cr. arr.

*Prereq: Permission of Instructor*

**Courses for graduate students:**

**V C S 604: Seminar**

Cr. 1. Repeatable. F.S.

**V C S 640: Advanced Radiology**

(2-0) Cr. 2.

*Prereq: V C S 448*

Detailed principles of clinical radiology with particular reference to radiographic interpretation.

**V C S 676: Advanced Medicine**

(2-0) Cr. 2.

*Prereq: V C S 445*

Principles of general medicine. A study in depth of factors that contribute to the development of clinical signs as related to the pathogenesis of disease.

**V C S 677: Advanced Medicine**

(2-0) Cr. 2.

*Prereq: V C S 445*

An advanced study of metabolic diseases.

**V C S 699: Research**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699A: Research: Medicine**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699B: Research: Surgery**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699C: Research: Theriogenology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699E: Research: Anesthesiology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

**V C S 699F: Research: Ophthalmology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Graduate Level Research.

**V C S 699G: Research: Cardiology**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor*

Graduate Level Research.

## Veterinary Diagnostic and Production Animal Medicine (VDPAM)

***Any experimental courses offered by VDPAM can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for professional curriculum students:**

**VDPAM 308: Spanish for Veterinarians**

(2-0) Cr. 2. S.

*Prereq: Classification in veterinary medicine and basic knowledge of Spanish*

This course is designed to meet the needs of veterinary students who will practice in an environment in which the use of Spanish for accurate client communication is essential which includes much of our food animal industry in the state of Iowa. This is not a traditional Spanish language course. To be successful, students taking the course should have a basic knowledge of Spanish pronunciation, grammar and syntax.

**VDPAM 309: Introduction to Production Animal Informatics**

(1-0) Cr. 1. S.

The fundamentals of how clinical, diagnostic, production and financial information is obtained and used by production animal operations will be presented. Students will acquire skills to create and use spreadsheets for manipulating and summarizing data. They will also acquire knowledge of where to find inexpensive and readily available resources with information on how to use spreadsheets and other software. Students will also have the opportunity to work with record keeping programs used by food animal operations.

**VDPAM 310: Introduction to Production Medicine**

Cr. 2. S.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

The role of the veterinarian in the management of animal health and production in populations including evaluation tools in dairy and beef cattle herds, beef feedlots and swine herds will be described. Provides veterinary students with a starting point to understand the principles and techniques that are the basis of food-animal population health diagnosis management programs. Course available on-line, attendance is not required.

**VDPAM 312: Introduction to Animal Welfare**

(1-0) Cr. 1. S.

*Prereq: First-year classification in veterinary medicine*

A continuation of the Veterinarian in Society series. The objective of this course is to develop knowledge of the fundamental principles of animal welfare, in terms of science, ethics and cultural components.

**VDPAM 340: Clinical Foundations**

(0-30) Cr. 1. S.

*Prereq: Vet Med classification*

One week, hands-on course at Iowa State University; introduction to food supply veterinary medicine covering overviews of major animal agriculture species (beef, dairy, swine, small ruminants, and camelid), production systems, behavior, welfare, handling and restraint, examination techniques, biosecurity, epidemiology and food safety. Students will visit farms owned by Iowa State University and private clients of Food Animal and Camelid Field Services to perform hands-on clinical skills. Attendance is mandatory. Biosecurity: All students must follow current college policies regarding animal contact following foreign travel. Additionally, no swine contact is allowed within 48 hours of the swine farm visit. Required equipment includes coveralls, rubber boots, thermometer and stethoscope.

**VDPAM 351: Bovine Embryo Transfer and Related Technology**

(2-0) Cr. 2. S.

*Prereq: Vet Med 2 or 3 classification*

This course will meet for two hours once each week of the Spring Semester. The first hour will be traditional lecture and the second hour will be a combination of student projects, labs and demonstrations of applied clinical procedures. Bovine embryo transfer and closely related topics such as: female reproductive physiology, estrus synchronization, semen sexing and reproductive disease will be emphasized. In addition, several class periods will be devoted to the use of ultrasound for diagnosis of reproductive and non-reproductive conditions.

**VDPAM 365: Animal Welfare Judging and Assessment**

Cr. 1. Repeatable. F.

Preparation for competition in the Intercollegiate Animal Welfare Judging Contest. Development of critical appraisal and oral communication skills in regard to animal welfare. Animal behavior, physiology, health and performance parameters, basic husbandry, housing and preventive care will be explored for select farmed, companion and exotic species. Optional field trips. Course is open to Vet Med, Undergraduate and Graduate students.

**VDPAM 402: Advanced Dairy Production Informatics**

(1-1) Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 309 or Permission of Instructor*

Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PC Dart as well as other dairy management and information software.



**VDPAM 402A: Advanced Dairy Production Informatics: Lecture Series**  
(1-1) Cr. 2. S.

*Prereq: Vet Med classification*

Advanced coverage of concepts related to collection, manipulation, analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart as well as other dairy management and information software.

**VDPAM 402B: Advanced Dairy Production Informatics: Experience I**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 402C: Advanced Dairy Production Informatics: Experience II**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A; VDPAM 402B*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 402D: Advanced Dairy Production Informatics: Experience III**  
(1-1) Cr. 2. F.S.

*Prereq: VDPAM 402A; VDPAM 402B; VDPAM 402C*

Independent records analysis and reporting of information used by dairy farms and their consultants. Hands on experience with Dairy Comp 305 and PCDart.

**VDPAM 407: Evidence Based Clinical Decision Making**

(Dual-listed with VDPAM 507). (1-0) Cr. 1. S.

*Prereq: Permission of instructor*

Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

**VDPAM 408: Poultry Diseases**

(Dual-listed with VDPAM 508). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

**VDPAM 409: Veterinary Practice Management and Organization**  
(2-0) Cr. 2. F.

*Prereq: Vet Med classification*

An A to Z introduction to proven veterinary practice management methods and strategies. The student will follow a detailed hands-on workbook describing most of the processes and procedures of day to day veterinary practice. Class content will be delivered via online modules.

**VDPAM 414: Veterinary Practice Entrepreneurship**  
(Dual-listed with VDPAM 514). Cr. 2-3. S.

*Prereq: Vet Med classification or Graduate student*

Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

**VDPAM 416: Bovine Reproduction Evaluation Laboratory**

(0-4) Cr. 1. F.S.

*Prereq: Vet Med 3 classification*

Bovine rectal palpation techniques will be repetitively taught in 7 four-hour sessions. Students will also learn techniques of epidural anesthesia, artificial insemination, pregnancy staging and ultrasonic imaging. University-owned cattle will be used. Spring semester only offered one section. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 419: Advanced Swine Production Informatics**

(1-0) Cr. 1. F.

*Prereq: VDPAM 309 or permission of instructor*

Advanced coverage of concepts related to the collection, manipulation, analysis, and reporting of information used by swine production companies. A quick review of modern swine production and measures of productivity ensures students have a firm base for applying the informatics. This course introduces students to one of the most commonly used swine record-keeping systems in the industry and gives them access to actual production data with which to work. Students then learn how to generate and interpret regularly used reports and will use pivot tables and budgeting models in Excel®. The importance of data entry and validation and how to transform data into useful knowledge are then addressed. Fundamentals of financial information, cost-benefit analysis and using budgeting models to assess the economics of animal health interventions are then applied.

**VDPAM 420: Applied Production Animal Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine with emphasis on government, industry or veterinary practice settings. Requires 40 hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420A: Applied Production Animal Medicine Preceptorship: Food Animal Emphasis**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in mixed animal production medicine with a food animal emphasis in veterinary practice settings. Requires 40 hours of clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420B: Applied Production Animal Medicine Preceptorship: General Mixed Animal Practice**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine in general mixed animal veterinary practice settings. Requires forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian, governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420C: Applied Production Animal Medicine Preceptorship: Government Agency or Food Processing Company**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Advanced course in production animal medicine with emphasis on government agency or food processing company in veterinary practice settings. Forty hours clinical experience per week. Assignments will be preceptorships with a governmental agency and/or production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 420P: Applied Poultry Production Medicine Preceptorship**

Cr. 1-6. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq: Fourth year classification in veterinary medicine required. VDPAM 408 and/or VDPAM 498 strongly recommended.*

Unique, highly relevant, hands-on veterinary experience for participating students Development of poultry-specific practice skill sets Documented experience that is highly valued by future poultry employers Enhanced cultural and professional awareness for participating students through interaction with active poultry practitioners Exposure to diverse poultry practice and production environments. Up to 6 credits to count for graduation.

**VDPAM 421: Great Plains Veterinary Educational Center**

Cr. 1. F.S.SS.

*Prereq: Vet Med 4 classification*

The Great Plains Veterinary Educational Center (GPVEC), located on the US Meat Animal Research Center (USMARC) near Clay Center, Nebraska offers one week clinical training in production animal medicine species. All sections will be held at GPVEC. Student must be able to provide own transportation to each site.

**VDPAM 421A: Great Plains Veterinary Educational Center: Calving**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Calving Elective provides an opportunity to expand knowledge and experience in all phases of calving management. The program is structured around normal calving operations at USMARC including emergency duties. Activities that take place during the Calving Elective including the diagnosis, treatment, and management of many commonly encountered conditions in the dam and calf, necropsies, and daily discussions. Participation in a caesarian section is not guaranteed. Student must be able to provide own transportation to each site.

**VDPAM 421B: Great Plains Veterinary Educational Center: Bull Breeding Soundness**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Bull Breeding Soundness Examination Elective involves training in all phases of the bull fertility examination as recommended by the Society for Theriogenology. Chuteside, hand-on experience is the primary training technique for this elective with informal discussions held during the performance of breeding soundness examinations on 350 or more bulls. Student must be able to provide own transportation to each site.

**VDPAM 421D: Great Plains Veterinary Educational Center: Feedlot Management**

Cr. 1. F.SS.

*Prereq: Vet Med 4 classification*

Evaluation of production techniques and production efficiency including ration and feeding management, health management program development and evaluation, environmental management, quality assurance and field necropsy techniques. Exposure to marketing and economic considerations in feed yard decision making. A strong emphasis on population medicine, trouble shooting and problem-solving skills in the beef industry, with exposure to harvest/food safety considerations. Discussions on pharmaceutical and feed additive usage and legal implications in food supply veterinary medicine. Student must be able to provide own transportation to each site.

**VDPAM 421E: Great Plains Veterinary Educational Center: Calf Weaning Management**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

This is a hands-on elective in which students participate in the weaning management at the USMARC. Students will be involved with processing, feeding, finding, and treating sick calves. Additionally, students will be introduced to developing weaning rations and managing feed delivery. Students will also learn how to develop vaccination and treatment protocols and each student will have as an objective the development of their own vaccination and treatment protocol template. As time allows, students will visit commercial feed yards and cover production management topics. Student must be able to provide own transportation to each site.

**VDPAM 421F: Great Plains Veterinary Educational Center: Pregnancy Examination**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

The Pregnancy Examination Elective involves rectal examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some palpation experience and are interested in honing their skills. Pregnancy Examination occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Student must be able to provide own transportation to each site.

**VDPAM 421J: Great Plains Veterinary Educational Center: Lambing**

Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Lambing Elective involves students working with the USMARC lambing crew and GPVEC faculty in observations, assistance with delivery when necessary, and routine lambing duties. Students will work with veterinary personnel in sheep necropsy and health surveillance. Self-study material will be provided covering topics such as pre-breeding and breeding, pregnancy diagnosis, pregnant ewe management, pre-lambing ewe/lambing management, feeder lamb health and nutrition management, and replacement ewe and ram management. Student must be able to provide own transportation to each site.

**VDPAM 421K: Great Plains Veterinary Educational Center: Equine Dentistry**

(20-20) Cr. 1. S.

*Prereq: Vet Med 4 classification*

The Equine Dentistry Elective provides the opportunity for students to expand their knowledge and experience related to equine dentistry. The rotation consists of lectures on topics relevant to equine dental care and hands-on laboratories during which students practice routine dental care procedures on USMARC horses. Equine Dentistry will involve both lecture and lab time at about equal shares. Student must be able to provide own transportation to each site.

**VDPAM 421P: Great Plains Veterinary Educational Center: Bovine Surgery**

Cr. 1. F.

*Prereq: Vet Med 4 classification*

The Bovine Surgery Elective is designed to give students interested in food animal surgery an opportunity to practice their surgical skills by performing penile translocations and epididymectomies on USMARC teaser bull candidates. Lectures specific to gomer bull surgery as well as other topics related to food animal surgery will be presented during this elective. Student must be able to provide own transportation to each site.

**VDPAM 421Q: Great Plains Veterinary Educational Center: Swine Husbandry**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This elective provides students the opportunity to gain hands-on experience related to the daily activities of an intensively managed confinement swine unit. Rotation participants will work closely with USMARC Swine Unit personnel as they complete their daily routines in the farrowing and breeding areas of the USMARC Swine Unit and will participate in piglet delivery, neonatal pig processing, artificial and natural breeding, necropsies, and other activities as they arise. Student must be able to provide own transportation to each site.

**VDPAM 421R: Great Plains Veterinary Educational Center: Lamb Weaning Management**

Cr. 1. SS.

*Prereq: Vet Med 4 classification*

This elective provides the opportunity for students to develop their skills in the area of health and nutritional management of sheep immediately before and after weaning. The rotation consists of lectures on pre- and post-weaning nutrition, clinical parasitology, and prevention and control of common ovine infectious diseases. Hands-on experience during the week will take place at the USMARC Sheep Unit and will consist of walk-through and hand-on examinations of recently weaned lambs, treatment of sick lambs, inspection of weaning pen environment, investigation of herd outbreaks, and post mortem examination of all sheep mortalities. Student must be able to provide own transportation to each site.

**VDPAM 421S: Great Plains Veterinary Educational Center: Ultrasound Pregnancy Examination**

Cr. 1. SS.

*Prereq: Vet Med 4 classification*

The Ultrasound Pregnancy Examination Elective involves transrectal ultrasonographic examinations for pregnancy, chuteside data collection and data entry into a computer software program to evaluate the reproductive performance of the herd. This elective is designed for students who have some ultrasound experience and are interested in honing their skills. This elective occurs during yearly fall herd work at the USMARC, therefore, speed and accuracy will be stressed, rather than basic technique. Didactic instruction may include several topics in cow herd health, nutrition, management and reproductive decision making. Student must be able to provide own transportation to each site.

**VDPAM 421T: Great Plains Veterinary Educational Center: Food Animal Clinical Care and Treatment (FACCT)**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This course is designed to achieve hands-on and critical thinking skills necessary to provide clinical care to cattle and sheep. Student needs will be met through structured discussions and accompanying the veterinarians in daily care of the animals at USMARC. Student must be able to provide own transportation to each site.

**VDPAM 421U: Great Plains Veterinary Educational Center: Necropsy and Diagnostic Investigations**

Cr. 1. F.S.

*Prereq: Vet Med 4 classification*

This course is designed to develop diagnostic and critical thinking skills necessary to investigate disease outbreaks in a herd health setting. Student needs will be met through daily necropsy procedures, in depth discussions of case examples, and thorough exposure to diagnostic tests and sampling procedures. Student must be able to provide own transportation to each site.

**VDPAM 422: Beef Cattle Calving**

Cr. 2. Repeatable. F.S.SS.

*Prereq: VDPAM 310; fourth year classification in veterinary medicine; permission of instructor*

This elective provides students opportunity to assist cow-calf operations with calving in Nebraska, South Dakota or other locations. These operations typically calve 300-1,000 head each spring. Calving experience is not required, but a good understanding of working around cattle is necessary. Students will be actively participating in the day to day, normal calving routine including detecting and sorting off "springers", calf "watch", detecting when intervention is needed and assisting delivery, caring for and monitoring newborns and dams for good health and early disease detection, tagging/processing new calves, treating calves needing intervention and performing other routine calving chores. Students need to provide their own transportation to the site and overnight stays at or near the production sites are required. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 424: Preceptorship in Diagnostic Pathology.**

Cr. 1-6. Repeatable. F.S.

*Prereq: VDPAM 455*

Advanced course in production animal medicine with emphasis on gross and diagnostic pathology. Forty hours clinical experience per week. Assignments will be preceptorships with a diagnostic laboratory, veterinary pathologist, governmental agency and/or production unit. Biosecurity policies require documentation of student's presence in the USA 5 days immediately prior to the start of class.

**VDPAM 426: Veterinary Toxicology**

(Dual-listed with VDPAM 526). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

**VDPAM 428: Principles of Epidemiology and Population Health**

(Dual-listed with VDPAM 528). (Cross-listed with MICRO, V MPM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**VDPAM 436: Beef Records Analysis**

(0-30) Cr. 1. F.S.

*Prereq: Vet Med 1, 2, or 3 classification*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability. Each semester's content builds on the material from the previous semester. Enrolling in the class for multiple semesters will be encouraged.

**VDPAM 436A: Beef Records Analysis: Introduction**

(0-30) Cr. 1. Repeatable. F.

*Prereq: Vet Med 1, 2, or 3 classification*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to become Beef Quality Assurance (BQA) certified through the Iowa Beef Center.

**VDPAM 436B: Beef Records Analysis: Herd Management**

(0-30) Cr. 1. Repeatable. S.

*Prereq: Vet Med 1, 2, or 3 classification; and VDPAM 436A*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

**VDPAM 436C: Beef Records Analysis: Cow/Calf Preventive Medicine**

(0-30) Cr. 1. Repeatable. F.

*Prereq: Vet Med 2 or 3 classification; and VDPAM 436A and VDPAM 436B*

Lectures will emphasize current production and evaluation techniques for beef cow/calf operations and students will learn to conduct and critically assess production and financial data using a standardized approach. Emphasis will be on obtaining a better understanding of nutritional and reproductive management of cow herds. Lab activities will allow students an opportunity to work with individual beef cattle producers to identify areas for improving profitability, health, and sustainability.

**VDPAM 436D: Beef Records Analysis: Feedlot Production Medicine**

(0-30) Cr. 1. Repeatable. S.

*Prereq: Second or third year classification in veterinary medicine, or special permission of instructor*

Lectures will emphasize current production and evaluation techniques for feedlot production and students will develop a standard treatment protocol book. Topics include respiratory disease, receiving programs, nutrition, cattle handling and environmental issues.

**VDPAM 445: Production Animal Clinical Medicine**

(3-0) Cr. 3. S.

*Prereq: Vet Med 3 classification*

Clinical diagnosis and treatment of diseases of swine, beef and dairy cattle, and small ruminants.

**VDPAM 450: Disturbances of Reproduction**

(4-0) Cr. 4. F.

*Prereq: Vet Med 3 classification*

General principles of normal reproductive functions in addition to environment, management and diseases causing disturbances in reproduction. Cattle, Swine, Equine, Small Ruminant, and Small Animal species will be covered.

**VDPAM 451: Clinical Embryo Transfer**

Cr. 2. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 351*

Elective clinical assignment in techniques of embryo transfer. Primary species studied will be bovine but equine and small ruminant embryo transfer will be covered during discussions. Enrollment is limited to four students per two week session. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 455: Diagnostic Laboratory Practicum**

Cr. 1. Repeatable. F.S.

*Prereq: Vet Med 4 classification and VDPAM 310*

Practical experience and training in necropsy, recognition of gross lesions, diagnostic sample collection and test selection for the diagnosis of infectious, toxic, nutritional and metabolic diseases through exposure to diagnostic cases submitted to the ISU Veterinary Diagnostic Laboratory. The VDL accepts cases from all species; however, this course predominantly consists of porcine and bovine cases.

**VDPAM 456: Veterinary Diagnostic Lab Methods & Applications**

(16-0) Cr. 1. F.

*Prereq: Vet Med 2 or 3 classification*

An introduction to diagnostic medicine including strengths and weaknesses of various testing technologies, how to choose appropriate tests and technologies, sampling strategies in diseased and non-diseased populations and interpretation and integration of results of tests to achieve an accurate diagnosis are discussed.

**VDPAM 463: Feedlot Production Medicine**

Cr. 1. S.

*Prereq: VDPAM 310: concurrent enrollment in VDPAM 421D.*

One-week VM4 elective focusing on Midwestern feedlot production.

Addresses feedlot production practices common to Iowa and surrounding states, including feeding cattle on concrete or under roofs. Activities include participation and visitation to representative feedlots in Iowa.

**VDPAM 465: Animal Welfare Clinical Rotation**

Cr. 2. F.SS.

*Prereq: Vet Med 4 classification*

Two-week course for senior veterinary students to gain skills for collecting and interpreting animal welfare data, aid clients with identifying and achieving welfare goals, and assisting law enforcement with animal cruelty response. Field trips to food animal and companion animal facilities are mandatory.

**VDPAM 471: Animal Reproduction**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in animal reproduction. Equine, Food Animal, Small Animal and Comparative reproduction only.

**VDPAM 471C: Animal Reproduction: Comparative**

Cr. 2. Repeatable, maximum of 4 credits. F.SS.

*Prereq: Vet Med 4 classification*

Elective comparative clinical assignment in Theriogenology with caseload management in Food Animal, Equine, Small Animal and Small Ruminants sections. Rotation through these different sections will depend on the caseload (by species) and include routine breeding management, semen collection and cryopreservation in different species, advanced laparoscopic and non-surgical procedures for insemination and embryo flushing/transfer, pregnancy diagnosis as well as management of reproductive emergencies.

**VDPAM 471E: Animal Reproduction: Equine Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in Equine Theriogenology involving both mare and stallion breeding management, cool-shipped semen preparation and semen cryopreservation, embryo transfer, foaling of high-risk pregnant mares as well as normal mares, breeding soundness exams of the mare and stallion, treatment of retained fetal membranes and neonatal care.

**VDPAM 471F: Animal Reproduction: Food Animal Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. S.SS.

*Prereq: Vet Med 4 classification*

Elective clinical assignment in Food Animal Theriogenology involving male and female breeding soundness exams, dystocia management, advanced diagnostic and surgical procedures, surgical and non-surgical insemination programs in small ruminants, and semen cryopreservation. Medical and surgical correction of reproductive disorders in cattle, swine and small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 471S: Animal Reproduction: Small Animal Reproduction**

Cr. 2. Repeatable, maximum of 4 credits. F.S.SS.

*Prereq: Vet Med 4 classification*

Primary reproductive management in the canine and feline involving breeding management of the bitch and stud dog, advanced surgical and non-surgical insemination using fresh, cooled or frozen semen, and infertility case management for the male and female. High risk pregnancy management, parturition and neonatal care of both canine and felines, as required.

**VDPAM 476: Food Animal and Camelid Field Service**

Cr. 1-2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Students will assist university veterinarians in delivering individual animal health care and herd-based production management services to the ISU livestock farms and other livestock farms in the local area. Focus on the establishment of best practices for herd management of production systems at the university and in the region. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 477: Food Animal and Camelid Medicine and Surgery**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Clinical assignment focused on the management of food animal and camelid medicine and surgery cases. Specific instruction in clinical evaluation of cases coupled with appropriate diagnostic testing and therapeutic intervention will be emphasized. Additional instruction will be provided in disease prevention, intensive care and management of food animal and camelid species. Particular emphasis will be placed on appropriate on-label and extra-label drug usage in food animal species. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.



**VDPAM 478A: Swine Medicine Education Center: Swine Production Management and Consultation**

Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 310*

Swine production management and consulting skills within a progressive swine production and management system. Time will be split approximately with half in-class discussion topics of finance and business of the swine industry and half on-farm learning opportunities where students will visit a breeding farm, nursery facility, finishing facility, wean-to-finish facility, gilt developer unit, and a truck wash facility.

**VDPAM 478B: Swine Medicine Education Center: Swine Clinical Pharmacology and Treatment Management**

Cr. 2. Repeatable. S.SS.

*Prereq: VDPAM 310*

Basic and applied information on swine treatment options, strategies to maximize efficacy, and skills to pursue judicious use of antimicrobials, reproductive interventions, and the entire spectrum of drug therapies. The course emphasizes case based application and decisions and is approximately 30% web-based and 70% on-site including farms of a variety of structures and functions. During the course, students prepare a thorough evaluation of the pharmacologic interventions that may occur on farms and then implement this evaluation in active production facilities to maximize efficacy, compliance and animal welfare as part of a comprehensive judicious use objective.

**VDPAM 478C: Swine Medicine Education Center: Swine Emerging Diseases and Emergency Response Management**

Cr. 2. Repeatable. F.S.

*Prereq: VDPAM 310 VDPAM 480*

Diagnostic tests, methods, approaches, analysis, and evaluation of emerging swine diseases and provide general knowledge of disease elimination and methods to manage herd losses and economic losses due to disease. Two-week, on-site module that combines structured site visits and classroom activities.

**VDPAM 479: Applied Swine Production Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Preceptorship course in swine production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will be preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 480: Swine Production Medicine**

(15-25) Cr. 2. Repeatable. F.S.SS.

*Prereq: VDPAM 310; Fourth year classification in Veterinary Medicine or permission of instructor*

Two week clinical rotation in swine production medicine. Students will be assigned to take the lead in investigating field based client cases with supervision of the instructors. Development of critical thinking skills that will allow students to apply concepts of herd management, production analysis, economic analysis, and disease prevention in addressing client cases. Variable amounts of travel to farm sites will be required with the potential for rare overnight stays. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 481: Advanced Cow/Calf Production Medicine**

(Dual-listed with VDPAM 581). (20-20) Cr. 2. S.

*Prereq: Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine*

Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 482: Applied Beef Production Medicine Preceptorship**

Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Advanced course in beef production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 483: Beef Production Medicine**

(15-20) Cr. 2. F.

*Prereq: Vet Med 4 classification and VDPAM 310*

Two week advanced clinical rotation in beef production medicine. Fifteen hours recitation/discussion and 20 hours clinical experience per week. This course is designed to expose students to cow-calf and feedlot production concepts. The activities scheduled for the rotation depend greatly on the time of year. Whenever possible, the class incorporates field trips to better understand how commercial cow/calf and feedlots operate and the veterinarian's role in their management. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 484: Dairy Production Medicine**

(15-20) Cr. 2. F.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Two week course in dairy production medicine combining class time with multiple on-farm visits to learn various management aspects (DHIA, DC305 & PC Dart record analysis, calf rearing through lactating cows, reproduction programs, udder health and milk quality, biosecurity, welfare, nutrition and cow comfort) for a wide variety of dairy operations. Students will learn the latest in dairy management by reviewing current topic articles and gain experience in farm evaluation through a group project. Fifteen hours recitation/discussion and 20 hours clinical experience per week. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 485: Applied Dairy Production Medicine Preceptorship**

(0-30) Cr. 1-6. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification and VDPAM 310*

Advanced course in dairy production medicine with emphasis on herd management, production analysis, and problem solving. Forty hours clinical experience per week. Assignments will include preceptorships with a practicing veterinarian and/or a production unit. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 486: Introduction to Small Ruminant Production Medicine**

(15-0) Cr. 1. S.

*Prereq: Vet Med 3 classification*

Survey of small ruminant production systems, common management practices, and disease processes of small ruminants and camelids. This course is intended to give the student a background in small ruminant medicine. Herd health, disease monitoring and prevention, nutrition, and typical management systems will be emphasized in lecture.

**VDPAM 487: Livestock Disease Prevention**

(3-0) Cr. 3. F.

The course is designed for both the pre-veterinary and animal science majors who have an interest in production animal health, disease prevention methods, epidemiology of economically important agents, and the ecology of currently important pathogens found in North American livestock industries. It will focus on disease prevention principles for individuals and large production population systems.

**VDPAM 488: Laboratory in Clinical Microbiology**

Cr. 1. Repeatable. F.S.

*Prereq: Vet Med 4 classification*

Application of microbiological procedures to the diagnosis of infectious diseases.

**VDPAM 489: Issues in Food Safety**

(Cross-listed with AN S, FS HN, HSP M). (1-0) Cr. 1. S.

*Prereq: Credit or concurrent enrollment in (FS HN 101 or FS HN 272 or HSP M 233); FS HN 403; (FS HN 419 or FS HN 420)*

Capstone seminar for the food safety minor. Case discussions and independent projects about safety issues in the food system from a multidisciplinary perspective.

**VDPAM 490: Independent Study**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of department chair*

**VDPAM 491: Advanced Ruminant Nutrition**

(30-10) Cr. 2. F.

Focus on dairy nutrition and balancing rations from the calf to the adult, lactating cow. Introduction to different feedstuffs and forage varieties to determine those that are best suited to bovine diets. This course starts the week immediately prior to the start of the fall semester and continues throughout the fall semester. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 494: Advanced Dairy Production Medicine**

(20-20) Cr. 2. S.

*Prereq: VDPAM 484 or permission of instructor*

Advanced course in investigating dairy herd problems relating to milk quality or nutrition. Milk quality and nutrition troubleshooting will be taught through the combination of lecture and on-farm investigations. Students will combine lecture knowledge, data acquired from on-farm investigations and record analysis to generate management plans. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 495: Advanced Small Ruminant Production Medicine**

(15-20) Cr. 2. F.S.

*Prereq: Vet Med 4 classification, VDPAM 486*

Two week clinical rotation in small ruminant production medicine. Field trips (including overnight stays) will be incorporated when possible. Topics to be covered include small ruminant industries (milk, meat, and fiber), milk quality, nutrition, reproduction, and disease management of small ruminants. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 496: International Experience**

(Dual-listed with VDPAM 596). Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Vet Med 2, 3, or 4 classification*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

### **VDPAM 498: Poultry Medicine**

Cr. 2. SS.

*Prereq: Vet Med 4 classification*

Two-week senior elective to introduce students into poultry production medicine in the Midwest. Students will participate in routine flock monitoring, biosecurity reviews, disease investigations involving outbreaks in commercial and backyard poultry operations, and have a basic understanding of the poultry industry and poultry diseases. Involves didactic lectures in the classroom, field trips to poultry farms, and necropsies.

**Courses primarily for graduate students, open to qualified undergraduates:**

### **VDPAM 507: Evidence Based Clinical Decision Making**

(Dual-listed with VDPAM 407). (1-0) Cr. 1. S.

*Prereq: Permission of instructor*

Discussion, lectures and laboratories to assess the quality and significance of medical evidence in making informed decisions about the treatment of individual animals and animal populations.

### **VDPAM 508: Poultry Diseases**

(Dual-listed with VDPAM 408). (2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: Second or third year classification in veterinary medicine or permission of instructor*

Bacterial, viral, parasitic, and nutritional diseases of domestic poultry and gamebirds; biosecurity, immunization, and management procedures to prevent poultry diseases. This course includes wet labs. Additional assignments required for graduate level credit.

### **VDPAM 514: Veterinary Practice Entrepreneurship**

(Dual-listed with VDPAM 414). Cr. 2-3. S.

*Prereq: Vet Med classification or Graduate student*

Formal exposure to the entrepreneurial and business skills necessary to own and operate a successful veterinary practice or other small business opportunity. Personal finance, marketing, human resource management, general accounting, site assessment, location demographics, practice valuation, and a host of other issues which must be considered when purchasing or starting a new business are covered. Class instruction will be delivered by successful practice and business owners with examples from real world experience.

### **VDPAM 526: Veterinary Toxicology**

(Dual-listed with VDPAM 426). (Cross-listed with TOX). (3-0) Cr. 3. S.

*Prereq: Third year classification in veterinary medicine, completion of TOX 501 or DVM degree*

Study of toxicological diseases of animals emphasizing clinical recognition, circumstances of poisoning, differential diagnosis with clinical and laboratory data, therapeutic procedures, preventive management and public health implications. Supplemented with case-based materials.

### **VDPAM 527: Applied Statistical Methods in Population Studies**

(3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: STAT 587*

ANOVA, Linear Regression, Model Selection, Mixed Models, ANCOVA, Repeated Measurement Analysis, MANOVA, Nonparametric Methods, Diagnostic Test Evaluation, ROC Curve Analysis, Generalized Linear Models, Logistic Regression, Survival Analysis, Cox Proportional Hazards Regression, Count Data Analyses. This course is available on campus and by distance.

### **VDPAM 528: Principles of Epidemiology and Population Health**

(Dual-listed with VDPAM 428). (Cross-listed with V MPM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

### **VDPAM 529: Epidemiological Methods in Population Research**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: STAT 587; VDPAM 528*

Train students on selecting the proper statistical model to conduct statistical analysis in the context of epidemiological studies. Train students to report and interpret data collected from experimental (clinical trials), observational (cross-sectional, case-control, cohort) or field-based studies incorporating the information covered in previous epidemiology/biostatistics courses and this course, and how to communicate the findings with the end-users. Introduce other methods that can be used when analyzing epidemiological studies. This course is available on campus and by distance.

### **VDPAM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EE0B, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**VDPAM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

**VDPAM 542B: Introduction to Molecular Biology Techniques: Protein**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS). Cr. 1. Repeatable. S.SS.

Techniques. Includes: fermentation, protein isolation, protein purification, SDS-PAGE, Western blotting, NMR, confocal microscopy and laser microdissection, Immunophenotyping, and monoclonal antibody production. Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

**VDPAM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

**VDPAM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**VDPAM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**VDPAM 542F: Introduction to Molecular Biology Techniques: Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**VDPAM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, V MPM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**VDPAM 546: Clinical and Diagnostic Toxicology**

(Cross-listed with TOX). (0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: D.V.M. degree or VDPAM 526*

Advanced study of current problems and issues in veterinary toxicology.

Emphasis on problem solving and interpreting clinical cases while utilizing clinical, epidemiological, and laboratory resources. Course consists highly of clinical case based material.

**VDPAM 551: Advanced Veterinary Diagnostic Pathology**

(0-3) Cr. 1-3. Repeatable. F.S.SS.

*Prereq: VDPAM 455; VPTH 570; VPTH 571*

Laboratory diagnosis of animal diseases with emphasis on gross and microscopic lesion description. Caseload is focused heavily on infectious diseases of food animals.

**VDPAM 560: Ecology of Infectious Diseases**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

Topics of applied ecology of infectious diseases. Specific objectives include: a) understanding dynamics of pathogen transmission within and between population; b) how to reduce risk of pathogen introduction in populations; c) how to early detect pathogens and classify herds according to disease status; d) how to quantify pathogen transmission and impact in animal populations; e) applying and measure the effect of interventions to manipulate disease transmission dynamics within and between populations. Develop skills to prevent, detect and/or significantly control/eliminate animal health issues from animal populations. Learn how to quantify health issues and estimate the value of interventions to influence and mitigate health problems.

**VDPAM 564: Animal Welfare Science and Research**

(3-0) Cr. 3. Alt. S., offered even-numbered years.

Animal welfare is increasingly a key component of societal decisions about animal use, sustainable development and human-animal relationships. Understanding animal welfare as a scientific discipline, with primary focus on veterinary, biomedical and animal science disciplines. Explore fundamental and applied approaches to animal welfare science, including experimental design, data analysis and interpretation of results. Topics selected will reflect student interests, and may include animal welfare assessment and assurance, animal cognition, pain assessment and mitigation, and animal models used in biomedical research.

**VDPAM 570: Risk Assessment for Food, Agriculture and Veterinary Medicine**

(Cross-listed with AGRON, TOX). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: Statistics 300-level or higher.*

Risk assessment principles as applied to biological systems. Exposure and effects characterization in human and animal health and ecological risk assessment. Risk analysis frameworks and regulatory decision-making. Introduction to quantitative methods for risk assessment using epidemiological and distributional analysis. Uncertainty analysis.

**VDPAM 581: Advanced Cow/Calf Production Medicine**

(Dual-listed with VDPAM 481). (20-20) Cr. 2. S.

*Prereq: Completion of two semesters of VDPAM 436 or UNL equivalent (V MED 596 Cattle Production), fourth year classification in veterinary medicine*

Two-week senior elective that will focus on the economics of animal disease in cow/calf operations. Evidence based medicine and epidemiological principles will be used in investigation of disease outbreaks. Extensive partial budgeting used. Students will complete at least two disease investigations involving outbreaks in commercial cow/calf operations and communicate their findings to the class, the herd owner, and local practitioner. Biosecurity: All students must follow current College policies regarding animal contact following foreign travel.

**VDPAM 590: Special Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Topics in medicine, surgery, theriogenology; beef, swine, dairy, or sheep production medicine.

**VDPAM 596: International Experience**

(Dual-listed with VDPAM 496). Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Vet Med 2, 3, or 4 classification*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**VDPAM 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Enrollment in nonthesis master's degree program*

**Courses for graduate students:**

**VDPAM 650: Swine Diagnostic Medicine**

Cr. 4. F.

*Prereq: Permission of Instructor*

A detailed study of swine diseases emphasizing the pathogenesis and diagnosis of swine respiratory, enteric, reproduction, metabolic, and septicemic diseases. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

**VDPAM 654: Comparative Antimicrobial Clinical Pharmacology**

Cr. 2. Alt. F., offered odd-numbered years.

*Prereq: Graduate student, resident, or intern in College of Veterinary Medicine*

Initial antimicrobial selection for infectious diseases of domestic animals. The antimicrobial drug groups will be examined, stressing pharmacokinetics, minimal inhibitory concentrations, and the use of these parameters to select appropriate compounds and dosages for maximum efficacy.

**VDPAM 655: Advanced Swine Production Medicine**

Cr. 4. Alt. S., offered odd-numbered years.

*Prereq: Permission of Instructor*

Detailed overview of applied techniques used in swine production medicine; production modeling and record analysis, facility design and management, analysis of competing intervention options, design and evaluation of therapeutic and vaccination strategies, quality control procedures and food safety. Course activities include interpretation of diagnostic case reports and development of diagnostic plans for specific disease objectives.

**VDPAM 699: Research**

Cr. arr. Repeatable.

## Veterinary Microbiology and Preventive Medicine (V MPM)

***Any experimental courses offered by V MPM can be found at:***

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for professional curriculum students:**

**V MPM 330: Global Health Disparities**

(Cross-listed with GLOBE). (3-0) Cr. 3. S.

*Prereq: Junior classification*

Historical and contemporary factors contributing to disparities in health outcomes for persons disadvantaged by income, location, ethnicity, sexual orientation, and abilities. Analysis and evaluation of health promotional materials, such as campaigns, and community-based interventions focused on reducing global health disparities.

Meets U.S. Diversity Requirement



**V MPM 360: Global Health**

(Cross-listed with GLOBE, MICRO). (3-0) Cr. 3. F.

*Prereq: BIOL 211*

Explores human health across the world with particular emphasis on low- and lower-middle-income countries. Attention is given to the interconnectedness of health determinants, problems, and solutions found in global health, including the role of animals and the environment. Broad in scope, highlighting different cultures and the historical foundations of global health. Topics include colonialism, poverty, emerging diseases, climate change, biodiversity, one health, maternal and child health, HIV, malaria, urbanization, noncommunicable diseases and more. Current events will be a feature of all class meetings. Meets International Perspectives Requirement.

**V MPM 378: Case Study IV**

(2-0) Cr. 2. S.

*Prereq: Vet Med classification*

Case-based applied learning that relates to the basic science courses. Emphasis on early integration of basic and clinical science concepts.

**V MPM 380: Veterinary Immunology**

(2-0) Cr. 2. S.

*Prereq: Vet Med classification*

Structure and function of the immune system in animals.

**V MPM 386: Veterinary Microbiology**

(3-5) Cr. 5. F.

*Prereq: Vet Med classification*

Bacteria and fungi of veterinary importance with emphasis on mechanisms of disease production and laboratory diagnostic procedures.

**V MPM 387: Veterinary Virology**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Basic principles of animal virology. Pathogenesis of viral infections. The nature and ecology of viruses of veterinary and zoonotic importance.

**V MPM 388: Public Health and the Role of the Veterinary Profession**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Fundamental epidemiology, zoonotic diseases, occupational health, food safety, other public health topics.

**V MPM 390: Topics in Veterinary History**

(1-0) Cr. 1. F.S.

An overview of the history of veterinary medicine focused primarily on disease-specific events. A review of the historical aspects of the veterinary profession's accomplishments in the discovery of the etiological origins of disease and their subsequent control will provide students with insights that are applicable to understanding and solving today's animal and human health challenges.

**V MPM 428: Principles of Epidemiology and Population Health**

(Dual-listed with V MPM 528). (Cross-listed with MICRO, VDPAM). (3-0) Cr. 3. S.

Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

**V MPM 437: Infectious Diseases and Preventive Medicine**

(3-0) Cr. 3. S.

*Prereq: Vet Med classification*

Etiology, epidemiology, laboratory diagnosis, regulatory control and preventive medicine aspects of the infectious diseases of swine, sheep, goats, cattle, horses, poultry, and honeybees.

**V MPM 486: Laboratory in Public Health**

Cr. 2. Repeatable. F.S.SS.

*Prereq: Vet Med 4 classification*

Discussions, lectures, exercises and field trips related to veterinary public health.

**V MPM 490: Independent Study**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V MPM 491: CDC Epidemiology Elective Preceptorship**

Cr. 6. F.S.SS.

*Prereq: Permission of Instructor*

Introduction to preventive medicine, public health and the principles of applied epidemiology within the working atmosphere of the Centers for Disease Control and Prevention.

**V MPM 496: International Experience**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Vet Med classification*

International Preceptorships and Study Abroad group programs. Opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**



### **V MPM 501: Basic Principles of Microbiology**

Cr. 3. F.

*Prereq: Master of Science in Biomedical Sciences (one-year, non-thesis) or Permission of Instructor*

The general principles of bacteriology, immunology and virology will be discussed. The structure and function of bacteria and viruses, the mechanisms of pathogenesis, and the host response to infectious agents will be reviewed. Vaccines, their failures, and new developments in vaccine development will be explored.

### **V MPM 502: Microbial Genetics and Genomics**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

The fundamental concepts of bacterial and bacteriophage genetics including mutagenesis, mechanisms of vertical and horizontal genetic information transfer and gene regulation are covered, along with genetic and genomic-based approaches to study these and other cellular processes of microorganisms. Review and discussion of research literature to examine experimental design, methodology, and interpretation of both historical and contemporary relevance to microbial genetics and genomics.

### **V MPM 517: Gut Microbiome: Implications for Health and Diseases**

(Cross-listed with AN S, FS HN, MICRO). Cr. 3. F.

*Prereq: 2-3 credits in microbiology and/or immunology.*

Explore current research on gut microbiome including modern tools used to study the gut microbiome. Examine the linkages between gut microbiome and health status, diseases, and manipulation of gut microbiome to improve health.

### **V MPM 520: Principles of Immunology**

(3-0) Cr. 3. F.

*Prereq: MICRO 310 or Permission of Instructor*

Nature of the immune system and its role in health and disease. Credit for either V MPM 520 or 575, but not both may be applied toward graduation.

### **V MPM 525: Intestinal Microbiology**

(Cross-listed with MICRO). Cr. 3. Alt. S., offered even-numbered years.

*Prereq: BIOL 313; MICRO 302*

Overview of commensal microbiota in the health and well-being of vertebrates. Topics include diversity of intestinal structure, microbial diversity/function, innate immune development, community interactions and metabolic diseases associated with alterations of the intestinal microbiome.

### **V MPM 528: Principles of Epidemiology and Population Health**

(Dual-listed with V MPM 428). (Cross-listed with VDPAM). (3-0) Cr. 3. S. Epidemiology of disease in populations. Disease causality, observational study design and approaches to epidemiologic investigations. This course is available on campus and by distance.

### **V MPM 536: Zoonoses and Environmental Health**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: (V MPM 386; V MPM 387; V MPM 388) or Permission of Instructor*  
Pathogenesis and control of zoonotic diseases. Factors influencing transmission and survival of pathogenic microorganisms in the environment.

### **V MPM 540: Livestock Immunogenetics**

(Cross-listed with AN S, MICRO). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: AN S 561 or MICRO 575 or V MPM 520*

Basic concepts and contemporary topics in genetic regulation of livestock immune response and disease resistance.

### **V MPM 542: Introduction to Molecular Biology Techniques**

(Cross-listed with B M S, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.SS.

Sessions in basic molecular biology techniques and related procedures. Offered on a satisfactory-fail basis only.

### **V MPM 542A: Introduction to Molecular Biology Techniques: DNA Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.

Includes genetic engineering procedures, sequencing, PCR, and genotyping. Offered on a satisfactory-fail basis only.

### **V MPM 542C: Introduction to Molecular Biology Techniques: Cell Techniques**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.S.

Includes: immunophenotyping, ELISA, flow cytometry, microscopic techniques, image analysis, confocal, multiphoton and laser capture microdissection. Offered on a satisfactory-fail basis only.

### **V MPM 542D: Introduction to Molecular Biology Techniques: Plant Transformation**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.

Includes: Agrobacterium and particle gun-mediated transformation of tobacco, Arabidopsis, and maize, and analysis of transformants. Offered on a satisfactory-fail basis only.

**V MPM 542E: Introduction to Molecular Biology Techniques: Proteomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.

Includes: two-dimensional electrophoresis, laser scanning, mass spectrometry, and database searching. Offered on a satisfactory-fail basis only.

**V MPM 542F: Introduction to Molecular Biology Techniques:****Metabolomics**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. F.

Includes: metabolomics and the techniques involved in metabolite profiling. For non-chemistry majoring students who are seeking analytical aspects into their biological research projects. Offered on a satisfactory-fail basis only.

**V MPM 542G: Introduction to Molecular Biology Techniques: Genomic**

(Cross-listed with B M S, BBMB, EEOB, FS HN, GDCB, HORT, NREM, NUTRS, VDPAM). Cr. 1. Repeatable. S.

Offered on a satisfactory-fail basis only.

**V MPM 575: Immunology**

(3-0) Cr. 3. S.

*Prereq: MICRO 310*

An examination of humoral and cellular immune function as well as the interaction of the cells and factors of the immune system that result in health and disease. Micro 475L optional. Credit for either Micro 475 or V MPM 520, but not both, may be applied to graduation.

**V MPM 586: Medical Bacteriology**

(Cross-listed with MICRO). (4-0) Cr. 4. F.

*Prereq: Permission of Instructor*

Bacteria associated with diseases of vertebrates, including virulence factors and interaction of host responses. Concurrent students need to register for 586L.

**V MPM 586L: Medical Bacteriology Laboratory**

(0-6) Cr. 2. F.

*Prereq: Permission of Instructor*

Laboratory in clinical bacteriology and mycology. Credit or enrollment in V MPM 586 or V MPM 625.

**V MPM 587: Animal Virology**

(4-0) Cr. 4.

*Prereq: Permission of Instructor*

Principles of animal virology. Biology of viruses associated with diseases of veterinary importance, including mechanisms of pathogenesis.

**V MPM 590: Special Topics**

Cr. 1-5. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V MPM 599: Creative Component**

Cr. arr.

*Prereq: Nonthesis M.S. Option only*

A written report based on laboratory research, library reading, or topics related to the student's area of specialization and approved by the student's advisory committee.

**Courses for graduate students:****V MPM 604: Seminar**

(1-0) Cr. 1. Repeatable. F.

Offered on a satisfactory-fail basis only.

**V MPM 608: Molecular Virology**

(Cross-listed with MICRO, PL P). (3-0) Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Permission of Instructor*

Advanced study of virus host-cell interactions. Molecular mechanisms of viral replication and pathogenesis.

**V MPM 615: Molecular Immunology**

(Cross-listed with BBMB, MICRO). (3-0) Cr. 3. Alt. F., offered odd-numbered years.

*Prereq: BBMB 405 or BBMB 506 and BBMB 507*

Current topics in molecular aspects of immunology: T and B cell receptors; major histocompatibility complex; antibody structure; immunosuppressive drugs and viruses; and intracellular signaling pathways leading to expression of genes that control and activate immune function.

**V MPM 625: Mechanisms of Bacterial Pathogenesis**

(Cross-listed with MICRO). (3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Credit in BBMB and MICRO*

Review of current concepts in specific areas of microbial pathogenesis including the genetic basis for bacterial disease, genetic regulation and control of virulence factors and their mechanisms of action, and host-pathogen interactions at the cellular and molecular levels. The application of microbial genetics to understanding pathogenesis will be included.

**V MPM 629: Advanced Topics in Cellular Immunology**

(2-0) Cr. 2. Alt. S., offered even-numbered years.

*Prereq: (V MPM 520 or V MPM 575) or Permission of Instructor*

Current topics and literature in cellular immunology. Topics include thymocyte development and selection, T cell interactions with antigen presenting cells, and lymphocyte effector functions.

**V MPM 660: Pathogenesis of Persistent Infections**

(Cross-listed with V PTH). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Permission of Instructor*

Study of current knowledge related to host pathogen interactions during persistent and chronic infections by bacteria, viruses and parasites.

**V MPM 690: Current Topics**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 690A: Current Topics: Immunology**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 690B: Current Topics: Infectious Diseases**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

Colloquia or advanced study of specific topics in a specialized field.

**V MPM 698: Seminar in Molecular, Cellular, and Developmental Biology**

(Cross-listed with BBMB, GDCB, MCDB, MICRO). (2-0) Cr. 1-2. Repeatable. S.

Student and faculty presentations.

**V MPM 699: Research**

Cr. arr. Repeatable.

## Veterinary Pathology (V PTH)

*Any experimental courses offered by V PTH can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for professional curriculum students:**

**V PTH 342: Anatomic Pathology I**

(Dual-listed with V PTH 542). (2-2) Cr. 3. S.

*Prereq: First-year classification in veterinary medicine.*

Basic pathology with emphasis on disease in animals and introduction to disease by system.

**V PTH 353: Introductory Parasitology**

(Cross-listed with BIOL, MICRO). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology and host-parasite relationships of major groups of animal parasites, and techniques of diagnosing and studying parasites.

**V PTH 372: Anatomic Pathology II**

(Dual-listed with V PTH 572). (3-3) Cr. 4. F.

*Prereq: V PTH 342*

Response to injury by each body system.

**V PTH 376: Veterinary Parasitology**

(Dual-listed with V PTH 576). (3-3) Cr. 4. F.

*Prereq: For V PTH 376, prereq: Second-year classification in veterinary medicine. For V PTH 576, prereq: Graduate classification and V PTH 542.*

Parasitic diseases of domestic animals and their control.

**V PTH 377: Case Study III**

(0-4) Cr. 2. F.

*Prereq: Second-year classification in veterinary medicine*

Clinical applications of the basic sciences taught concurrently in the fall semester of the second year curriculum in veterinary medicine.

**V PTH 401: Basics of Medical Terminology**

(1-0) Cr. 1. F.

Discussion of prefixes, suffixes, and roots (mostly from Latin and Greek) that comprise medical terms.

**V PTH 402: Introduction to Pathology**

(Cross-listed with BIOL). (3-0) Cr. 3. F.

*Prereq: BIOL 211; BIOL 211L; BIOL 212; BIOL 212L*

Introductory exploration of pathology as a medical discipline. This includes study of disease mechanisms via an introduction to general pathology topics (cell degeneration, necrosis, disturbances of growth, disturbances of blood flow, inflammation, neoplasia) and organ system-specific response to injury.

**V PTH 409: Introduction to Veterinary Cytology and Laboratory Techniques**

(0-2) Cr. 1. S.

*Prereq: Third-year classification in veterinary medicine*

Description, interpretation, and techniques for cellular preparations from tissues and body fluids.

**V PTH 425: Clinical Pathology**

(2-4) Cr. 4. S.

*Prereq: V PTH 372*

Principles of clinical hematology, clinical chemistry, and urinalysis in domestic animals.

**V PTH 456: Necropsy Laboratory Practicum**

Cr. 1. Repeatable.

*Prereq: Vet Med 4 classification*

Practicum in postmortem examination and diagnosis.

**V PTH 457: Clinical Pathology Laboratory Practicum**

Cr. 1. Repeatable.

*Prereq: Vet Med 4 classification*

Methodology in clinical chemistry, hematology and cytology; practice in interpretation of laboratory data.

**V PTH 490: Independent Study**

Cr. arr. Repeatable.

*Prereq: Permission of Instructor; Permission of Department Chair*

**V PTH 492: Orientation for International Experience**

(2-0) Cr. 1. Repeatable. S.

*Prereq: Vet Med classification*

8 weeks. Predeparture orientation for group study abroad. Cultural considerations for the study abroad experience and a conversational language introduction. Out of class work will be assigned. Offered on a satisfactory-fail basis only.

**V PTH 495: Clinical Competency Skills Checklist/Remediation**

Cr. R. S.

*Prereq: Vet Med 4 classification*

In order to graduate, all 4th year veterinary students are required to complete a checklist of clinical procedures and complete any assigned remediation (based on evaluation in core clinical rotations). These requirements are tied to the college's AVMA COE accreditation, and this course is used to document completion of those requirements. Offered on a satisfactory-fail basis only.

**V PTH 496: International Experience**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Second-year classification in veterinary medicine*

International Preceptorships and Study Abroad Group programs. Opportunities for students to be involved in applied clinical, production, and/or research experience in international locations. The course consists of 40 hour per week experiential learning opportunities.

**Courses primarily for graduate students, open to qualified undergraduates:**

**V PTH 503: Principles of Pathology**

(3-0) Cr. 3. S.

*Prereq: Graduate classification; permission of instructor*

Introductory exploration of pathology as a medical discipline. This includes study of disease mechanisms via an introduction to general pathology topics (cell degeneration, necrosis, disturbances of growth, disturbances of blood flow, inflammation, neoplasia) and organ system-specific response to injury.

**V PTH 530: Teaching and Learning in Veterinary Medical Education**

(3-0) Cr. 3. Alt. F., offered even-numbered years.

Study of principles of teaching and learning as they relate to veterinary medical education. These include: theories of learning, analyzing content/learners/context, identifying goals, identifying appropriate instructional strategies (specific to medical education), matching assessment processes to goals and strategies, common curricular approaches and decision-making processes in medical education, and the scholarship of teaching and learning for veterinary medical educators.

**V PTH 542: Anatomic Pathology I**

(Dual-listed with V PTH 342). (2-2) Cr. 3. S.

*Prereq: First-year classification in veterinary medicine.*

Basic pathology with emphasis on disease in animals and introduction to disease by system.

**V PTH 548: Diagnostic Parasitology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 376 or V PTH 576*

Contact hours are (0-3 to 0-9). A laboratory experience in the technical and applied aspects of veterinary parasitology.

**V PTH 549: Clinical Pathology Laboratory**

(0-3) Cr. 1. Repeatable. F.S.SS.

*Prereq: V PTH 457; permission of instructor*

Laboratory procedures and clinical interpretations with emphasis on hematology, cytology, and clinical chemistry. Offered on a satisfactory-fail basis only.

**V PTH 550: Surgical Pathology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 570 or V PTH 571; permission of instructor*

Contact hours are (0-3 to 0-9). Diagnosis of lesions in biopsy specimens; classification of neoplasms. Course includes rotation through departmental biopsy service and review of selected cases from departmental archives. Offered on a satisfactory-fail basis only.

**V PTH 551: Postmortem Pathology Laboratory**

Cr. 1-3. Repeatable. F.S.SS.

*Prereq: V PTH 542; permission of instructor*

Contact hours are (0-3 to 0-9). Necropsy techniques of animals with emphasis on gross and microscopic lesions and diagnosis. Offered on a satisfactory-fail basis only.

**V PTH 554: Ethics in Scientific Research and Writing**

(1-0) Cr. 1. Alt. S., offered even-numbered years.

*Prereq: Graduate classification*

Ethical conduct in biomedical research, criticism, writing, and adherence to regulations. Offered on a satisfactory-fail basis only.

**V PTH 570: Systemic Pathology I**

(4-0) Cr. 4. Alt. F., offered even-numbered years.

*Prereq: Graduate Classification; V PTH 372 or Permission of Instructor*  
Pathology of the respiratory, reproductive, endocrine, musculoskeletal, and cardiovascular systems. Emphasis on pathogenesis and histopathology correlated with interpretive clinical pathology where appropriate. DVM degree required.

**V PTH 571: Systemic Pathology II**

(4-0) Cr. 4. Alt. F., offered odd-numbered years.

*Prereq: Graduate Classification; V PTH 372 or Permission of Instructor*  
Pathology of the integumentary, urinary, digestive, lymphoid, and nervous systems and special senses. Emphasis on pathogenesis and histopathology correlated with interpretive clinical pathology where appropriate. DVM degree required.

**V PTH 572: Anatomic Pathology II**

(Dual-listed with V PTH 372). (3-3) Cr. 4. F.

*Prereq: V PTH 342*

Response to injury by each body system.

**V PTH 576: Veterinary Parasitology**

(Dual-listed with V PTH 376). (3-3) Cr. 4. F.

*Prereq: For V PTH 376, prereq: Second-year classification in veterinary medicine. For V PTH 576, prereq: Graduate classification and V PTH 542.*  
Parasitic diseases of domestic animals and their control.

**V PTH 590: Special Topics**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590A: Special Topics: Veterinary Pathology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590B: Special Topics: Veterinary Parasitology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590C: Special Topics: Veterinary Toxicology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590D: Special Topics: Veterinary Clinical Pathology**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 590E: Special Topics: Other**

Cr. 1-4. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

**V PTH 596: International Preceptorship**

Cr. 1-12. Repeatable. F.S.SS.

*Prereq: Admission to Graduate college*

International Preceptorships and Study Abroad Group programs.

This course will provide opportunities for students to be involved in applied clinical, production, and/or research experiences in international locations. The course consists of 40 hour per week experiential learning opportunities. Offered on a satisfactory-fail basis only.

**V PTH 599: Creative Component Research**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599A: Creative Component Research: Veterinary Pathology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599B: Creative Component Research: Veterinary Parasitology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599C: Creative Component Research: Veterinary Toxicology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**V PTH 599D: Creative Component Research: Veterinary Clinical Pathology**

Cr. arr. Repeatable.

Course for departmental graduate research.

**Courses for graduate students:**

**V PTH 604: Pathology Case Seminar**

Cr. 1-2. Repeatable. F.S.

*Prereq: Permission of Instructor*

Description and interpretation of microscopic lesions and clinical pathology data collected from cases of natural and experimental disease. Offered on a satisfactory-fail basis only.

**V PTH 605: Current Topics Seminar**

Cr. 1. Repeatable. F.S.SS.

*Prereq: Permission of Instructor*

A seminar of graduate research at the time of thesis or dissertation defense.

**V PTH 606: Diagnostic Interpretation**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606A: Diagnostic Interpretation: Veterinary Pathology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606B: Diagnostic Interpretation: Veterinary Parasitology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606C: Diagnostic Interpretation: Veterinary Toxicology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 606D: Diagnostic Interpretation: Veterinary Clinical Pathology**

Cr. R. F.S.SS.

*Prereq: Permission of Instructor*

A comprehensive examination in the diagnostic description and interpretation of case materials relevant to veterinary pathology and areas of specialization for the graduate degree preliminary examination.

**V PTH 655: Cellular and Molecular Pathology I**

(3-0) Cr. 3. Alt. S., offered odd-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of cell injury, cellular responses to injury, and inflammation. Graduate course in biochemistry, genetics, or cell biology recommended.

**V PTH 656: Cellular and Molecular Pathology II**

(Cross-listed with TOX). (3-0) Cr. 3. Alt. S., offered even-numbered years.

*Prereq: Graduate course in biochemistry, genetics, or cell biology*

Cellular and molecular mechanisms of carcinogenesis.

**V PTH 660: Pathogenesis of Persistent Infections**

(Cross-listed with V MPM). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Permission of Instructor*

Study of current knowledge related to host pathogen interactions during persistent and chronic infections by bacteria, viruses and parasites.

**V PTH 661: Comparative Immunology and Infectious Disease**

(Cross-listed with IMBIO). (2-0) Cr. 2. Alt. S., offered odd-numbered years.

*Prereq: Graduate level Immunology or Permission of Instructor*

Discuss and define similarities and differences of varied host responses to infectious challenge. Learning will focus on comparative aspects of the host response and the unique aspects of immunity from different organisms, while highlighting molecular and mechanistic similarities of pathogen recognition, response and resolution.

**V PTH 679: Histopathology of Laboratory Animals**

(1-2) Cr. 2.

*Prereq: V PTH 570 or V PTH 571; Permission of Instructor*

Study of microscopic lesions in laboratory animals with emphasis on description, etiology, pathogenesis, and diagnosis.

**V PTH 699: Research**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699A: Research: Veterinary Pathology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699B: Research: Veterinary Parasitology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699C: Research: Veterinary Toxicology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

**V PTH 699D: Research: Veterinary Clinical Pathology**

Cr. arr. Repeatable.

Course restricted to graduate program within the department.

## Wind Energy Science, Engineering and Policy (WESEP)

*Any experimental courses offered by WESEP can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**



**WESEP 501: Wind Energy Resources**

(3-0) Cr. 3.

*Prereq: Graduate standing*

Forecasting, wind measurement and analysis, site placement, aerodynamic principles associated with blade design, power generation technologies, power electronic topologies used in wind energy conversion, collection circuits, and grid operation with high wind penetration.

**WESEP 502: Wind Energy Systems**

(3-0) Cr. 3.

*Prereq: Graduate standing*

Systems approach to wind turbine design, manufacturing, installation, integrated with wind economics and policy issues. Topics include manufacturing practices used to produce wind turbines, construction practices, sensing and inspection technologies used in monitoring wind farm health, and the impact of policy making on the wind energy industry.

**WESEP 511: Wind Energy System Design**

(Cross-listed with AER E). (3-0) Cr. 3.

*Prereq: WESEP 501 and WESEP 502*

Advanced design, control, and operation of wind plants. Topics include electromechanical energy conversion systems, aerodynamic and aeroelastic loads, optimal control of wind farms, life cycle management strategies, tall tower design, and prediction of component residual life.

**WESEP 590: Special Topics**

Cr. 1-3. Repeatable.

Advanced study of a research topic in the field of wind energy, science, engineering, and policy.

**WESEP 594: Wind Energy Real-Time Research Collaborative Seminar**

(1-0) Cr. 1. Repeatable. F.S.

*Prereq: Graduate standing*

Identifying current wind energy research issues and conducting components of the research cycle in real-time, including proposal development, investigation/analysis/discovery, publication and presentation, ethical behavior, and leadership.

## Women in Science and Engineering (WISE)

*Any experimental courses offered by WISE can be found*

*at:* [registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****WISE 201: Foundations in Development for Women\* in STEM**

Cr. 3. F.

Foundation for developing skills and attitudes needed for responsible citizenship and complex problem solving in STEM. Exploration of experiences of diverse women\* leaders in STEM fields. Development of an awareness that experiences in STEM cultures vary among women and intersecting identities and becoming open to diverse perspectives. Across multiple disciplinary perspectives in STEM, engagement with peers across STEM fields, development of community in small groups with peer leaders, and building of relationships with university leadership, industry professionals, and company executives.

**WISE 307: Women in Science and Engineering**

(Cross-listed with BIOL, WGS). (3-0) Cr. 3. F.

*Prereq: 200 level course in science, engineering or women's studies; ENGL 250*

The interrelationships of women and science and engineering examined from historical, sociological, philosophical, and biological perspectives. Factors contributing to under-representation; feminist critiques of science; examination of successful strategies. Does not satisfy biology major advanced credit requirements.

## Women's and Gender Studies (WGS)

*Any experimental courses offered by WGS can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for undergraduates:****WGS 160: Gender Justice**

(2-0) Cr. 1. F.S.

Half semester course. Examines the socialization process in the United States and how our perspectives are formed. An introduction to patriarchy, sexism, and ally development are explored. Skills to enhance communication and understanding among women and men will be developed. Offered on a satisfactory-fail basis only.

**WGS 201: Introduction to Women's and Gender Studies**

(3-0) Cr. 3.

Introduction to the interdisciplinary field of Women's and Gender Studies. Contemporary status of women in the U.S. and worldwide from social, economic, historical, political, philosophical and literary perspectives. Analysis of intersection of gender, race, class, and sexuality. Subject matter includes work, health, sexuality, and violence. Foundation for the other courses in the program.

Meets U.S. Diversity Requirement

**WGS 203: Introduction to Lesbian Communities**

(3-0) Cr. 3.

Study of contemporary and historic lesbian cultures and communities from a US and international perspective. Addresses issues of race, class, gender and sexuality as they intersect with the formation of lesbian identities. Explores who identifies as lesbian and how that dis/enables political resistance and formation of community.

**WGS 205: Introduction to Queer Studies**

(3-0) Cr. 3.

*Prereq: ENGL 150*

Interdisciplinary study of issues relating to lesbian, gay, bisexual, transgender, and queer identities in the U.S. Attention will be given to race and socioeconomic class.

**WGS 210: Gender and Sexuality in American Pop Culture**

(3-0) Cr. 3.

Introduction to research and theory examining the ways gender and sexuality are conveyed through popular culture texts. Analysis of codes and their influence on the development of identities that shape how we view the world. Discussion of intersectional topics including race and class.

**WGS 301: International Perspectives on Women and Gender**

(3-0) Cr. 3. F.S.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Study of women in a range of cultures, depending on faculty specialization. Special emphasis on women in development seen in postcolonial context.

Meets International Perspectives Requirement.

**WGS 307: Women in Science and Engineering**

(Cross-listed with BIOL, WISE). (3-0) Cr. 3. F.

*Prereq: 200 level course in science, engineering or women's studies; ENGL 250*

The interrelationships of women and science and engineering examined from historical, sociological, philosophical, and biological perspectives. Factors contributing to under-representation; feminist critiques of science; examination of successful strategies. Does not satisfy biology major advanced credit requirements.

**WGS 308: Write Like a Woman**

(Cross-listed with ENGL). (3-0) Cr. 3. F.

*Prereq: ENGL 250*

Writing and reading interpretive fiction written by women. Emphasis on stories that embody a female literary life, gender-specific ways of creating characters and conflicts, analytical reading and writing, workshop criticism and shared commentaries. Includes multi-modal projects.

**WGS 320: Ecofeminism**

(Cross-listed with ENV S). (3-0) Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Women's relationships with the earth, non-human nature, and other humans. The course explores the connections between society's treatment of women and nature; origins of ecofeminism and how it relates to the science of ecology, conventional and sustainable agriculture as well as how ecofeminism relates to other branches of feminist philosophy. Evaluation and critique of modern science, technology, political systems and SOLUTIONS will be included.

**WGS 321: Economics of Discrimination**

(Cross-listed with ECON). (3-0) Cr. 3.

*Prereq: ECON 101*

Economic theories of discrimination. Analysis of the economic problems of women and minorities in such areas as earnings, occupations, and unemployment. Public policy concerning discrimination. Poverty measurement and antipoverty programs in the U.S.

**WGS 323: Gender and Communication**

(Cross-listed with SP CM). (3-0) Cr. 3.

Examination of how understanding and enactment of gender identity is shaped by communication. Verbal and nonverbal communication across various contexts including personal relationships and the media. Explores discourse of social movements aiming to transform cultural definitions of gender.

Meets U.S. Diversity Requirement

**WGS 325: Portrayals of Gender and Sexualities in the Media**

(3-0) Cr. 3.

*Prereq: Sophomore classification*

Survey of how the media and popular culture portray gender and sexualities and the impact on individuals and society. Images of women, men, transgender as well as heterosexual, non-heterosexual and others. Studies both historical and emerging images in the media in terms of stereotypes and positive images.

**WGS 327: Gender and Sexualities in Society**

(Cross-listed with SOC). (3-0) Cr. 3. F.S.SS.

*Prereq: SOC 134*

Develop a foundational understanding of the role of gender and sexuality in society. Students will explore the biological, social, and cultural meanings of gender and sexuality and their intersections with class, race/ethnicity, ability, socioeconomic status and other identities. Contemporary social science research, theories, and feminist perspectives as they relate to gender and sexuality, and explores gender and sexuality within families, education, the media, politics, and the economy.

**WGS 328: Sociology of Masculinities and Manhood**

(Cross-listed with SOC). (3-0) Cr. 3. S.

*Prereq: SOC 134 or WGS 201*

Examination of socially constructed and idealized images of manhood, the nature of social hierarchies and relations constructed on the basis of imagery, ideologies, and norms of masculinity. Theories on gender (sociological, psychological, and biological). Particular attention given to theory and research on gender variations among men by race, class, ethnicity, sexual orientation, physical ability and age.

**WGS 333: Women, Gender, and Leadership**

(Cross-listed with LD ST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

An intersectional approach to understanding gender and leadership as it relates to women from various races, ethnicities, gender identities, sexual orientations and abilities.

Meets U.S. Diversity Requirement

**WGS 336: Religion, Sex and Gender**

(Cross-listed with RELIG). (3-0) Cr. 3. F.

*Prereq: (3 credits in RELIG or WGS) or Permission of Instructor*

Gender and sexuality in the historical and contemporary contexts of various religious traditions.

Meets International Perspectives Requirement.

**WGS 338: Feminist Philosophy**

(Cross-listed with PHIL). (3-0) Cr. 3. F.

A critical, theoretical examination of the philosophical and intellectual commitments that underlie feminist projects. Questions of identity, knowledge, and ethics will be considered from both historical and contemporary perspectives. Topics will include sex and gender, self and other, nature and nurture, masculinity and femininity, equity and justice, patriarchy, oppression, and intersectionality. 3 credits in PHIL or WGS recommended.

**WGS 339: Goddess Religions**

(Cross-listed with RELIG). (3-0) Cr. 3.

Focal study of selected global Goddess traditions in context, including American Goddess spirituality. Historical and cross-cultural images, identities, and discourses of female divinity.

**WGS 342: Culture, Sex, and Gender**

(Cross-listed with ANTHR). (3-0) Cr. 3. S.

Cross-cultural examination of gender and sexuality. Emphasis on global and transnational perspectives. Topics will include varied gender and sexual expressions, status and roles, intersectionality in global or transnational contexts, and the examination of systems of oppression cross-culturally. ANTHR 201 or WGS 201 recommended.

Meets International Perspectives Requirement.

**WGS 344: Human Reproduction**

(Cross-listed with BIOL). (3-0) Cr. 3. S.

*Prereq: BIOL 212*

Biology of human reproduction, including reproductive systems, hormones, and endocrinology of pregnancy, presented from a clinically-oriented perspective. Reviews health-related conditions such as infertility, sexually-transmitted diseases, and complicated pregnancy.

**WGS 345: Women and Literature: Selected Topics**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: ENGL 250*

Focused study of literature by women and about women that focuses on a particular genre (fiction, non-fiction, poetry, film, drama, media), author, or theme.

**WGS 346: Psychology of Women**

(Cross-listed with PSYCH). (3-0) Cr. 3. S.

*Prereq: PSYCH 101; 1 additional PSYCH course*

Survey of theory and research related to major biological, interpersonal, and cultural issues affecting girls' and women's psychological development and behavior.

**WGS 350: Women of Color in the U.S**

(Cross-listed with AF AM). (3-0) Cr. 3.

*Prereq: 3 credits in WGS or AF AM*

Economic, social, political and cultural roles of Women of Color in the U.S. Includes literary, philosophical, and artistic expressions. Myths and realities explored.

**WGS 352: Queer Literature**

(Cross-listed with ENGL). (3-0) Cr. 3.

*Prereq: ENGL 250*

Focused study of literary portrayals of queer lives and relationships from many different genres. Attention to changing definitions and representations of sexual orientation and LGBTQ identities over time.

**WGS 370: Studies in English Translation**

(3-0) Cr. 3.

Readings, discussions, and papers in English.

Meets International Perspectives Requirement.

**WGS 370F: Studies in English Translation: French Topics on Women and Gender Studies**

(Cross-listed with FRNCH). (3-0) Cr. 3. Repeatable.

Topics vary according to faculty interest. Readings, discussions, and papers in English.

Meets International Perspectives Requirement.

**WGS 370G: Studies in English Translation: German Topics on Women or Feminism**

(Cross-listed with GER). (3-0) Cr. 3-4. Repeatable, maximum of 6 credits.

*Prereq: Sophomore classification*

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Three credits: English, open to all students. Four credits: Required for German concentration credit, supplementary readings and compositions in German. For enrollment in fourth credit, 6 credits in GER at the 300-level.

Meets International Perspectives Requirement.

**WGS 370R: Studies in English Translation: Russian Topics on Women or Feminism**

(Cross-listed with RUS). (3-0) Cr. 3. Repeatable.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English.

Meets International Perspectives Requirement.

**WGS 370S: Studies in English Translation: Hispanic Topics on Women or Feminism**

(Cross-listed with SPAN). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

Topics vary according to faculty interest. Author, genre or period study, women writers, cinema, or contemporary theory. Readings, discussions, and papers in English. May not be counted as a prerequisite.

Meets International Perspectives Requirement.

**WGS 374: Sex, Gender, and Culture in the Ancient Mediterranean World**

(Cross-listed with CL ST, HIST). (3-0) Cr. 3.

Survey of the roles of women and others on the margins and the issues that impacted them in the ancient Greek and Roman worlds.

Evidence from literature, the visual arts, and archaeology. Contemporary approaches to studying women, gender, and sexuality in ancient history.

Intersections of gender categories with ideas of slave and free status, citizenship, and ethnicity. Readings from ancient and modern sources.

Meets International Perspectives Requirement.

**WGS 380: History of Women in Science, Technology, and Medicine**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

History of women's relationship to the fields of science, technology, and medicine, as students and professionals, consumers, subjects and patients, family members, workers and citizens. Concentrates especially on 19th and 20th century United States, concluding with an examination of current issues of special interest to women in science, technology, and medicine.

Meets U.S. Diversity Requirement

**WGS 385: Women in Politics**

(Cross-listed with POL S). (3-0) Cr. 3. S.

Entry and participation of women in politics in the United States and other countries. Contemporary issues and strategies for change through the political process.

Meets U.S. Diversity Requirement

**WGS 386: History of Women in America**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq: Sophomore classification*

A survey of social, economic, and political aspects of women's role from colonial era to present; emphasis on employment, education, concepts of sexuality, and changing nature of the home.

Meets U.S. Diversity Requirement

**WGS 387: First Ladies in U.S. History**

(Cross-listed with HIST, POL S). Cr. 3. Alt. F., offered even-numbered years.

*Prereq: Sophomore classification*

Evolution of the role and office of the First Lady in U.S. history, including her political activism, social impact, and international influence. Analysis of the authority, intersectionality, and agency of First Ladies in the aggregate and exploration of how individual First Ladies have interpreted and adapted this unique public position.

**WGS 401: Feminist Theories**

(3-0) Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Current theories of feminism, the feminine and sexual difference.

Topics in race, class, sexuality, and ethnicity as they are addressed in diverse feminisms. May include readings in lesbian, Black, postcolonial, psychoanalytic and postmodern thought.

Meets U.S. Diversity Requirement

**WGS 402: Feminist Research in Action**

(3-0) Cr. 3. S.

*Prereq: WGS 201; WGS 301*

Feminist research methods and scholarship. Class collaborates on a community research and action project to improve women's lives.

**WGS 410: Human Trafficking**

(Dual-listed with WGS 510). (Cross-listed with SOC). Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Issues related to human trafficking and modern-day slavery in the US and world. History of and concepts defining forms of violence experienced by trafficking victims and methods used to recruit and control victims. Students will learn how to educate others about this crime against humanity. Examines international, federal, and state legislation to prevent human trafficking. Only one of WGS 410 may count toward graduation

**WGS 422: Women, Men, and the English Language**

(Cross-listed with ENGL, LING). (3-0) Cr. 3. S.

*Prereq: ENGL 219 or LING 219*

The ways men and women differ in using language in varied settings and the ways in which language both creates and reflects gender divisions.

**WGS 425: Intersections of Race, Class and Gender**

(Dual-listed with WGS 525). (3-0) Cr. 3.

*Prereq: WGS 201; 1 additional WGS course*

Race, ethnicity, class and gender distinctions and intersections lead to inequitable distributions of power, social well-being, and resources. Explores how inequities are institutionalized and how multiple identities are experienced by women in daily life. Meets U.S. Diversity Requirement

**WGS 430: Gender and Consumer Culture**

(3-0) Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Historical roots of consumer culture, political economy, technology, and how the rise of the mass-market intersects with cultural ideas of gender, race, class, and sexuality. How gender, as well as personal and group identities, is formed through all forms of consumption. Examination of gendered advertising, material goods, and lifestyles created around specific acts of consumption.

**WGS 435: Gender, Globalization and Development**

(Dual-listed with WGS 535). (3-0) Cr. 3.

*Prereq: WGS 301*

Cross-cultural study of historical and contemporary dimensions of gender, globalization and development. Explores the interdependence of socio-economic and political aspects of globalization using feminist postcolonial and transnational frameworks. Analyses of case studies and activism in contexts of economic livelihoods, environmental justice, and cross-border migrations.

**WGS 440: Gender Issues in Sports**

(3-0) Cr. 3.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Social, economic, political, and cultural variables that influence and shape sports, especially for girls and women. Topics include Title IX, coaching and administrative challenges for women, media and gender, and issues related to eating disorders, homophobia, and gender identity in sport.

**WGS 450: Topics in Women's and Gender Studies**

(3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: WGS 201 or 3 credits in WGS at the 300 level or above*

Advanced research and theory related to special topics and issues in women's and gender studies. Specific topics indicated in the schedule of classes. A maximum of 6 credits of W S / WGS 450 can count toward graduation.

**WGS 457: History of American Sexualities**

(Cross-listed with HIST). Cr. 3.

*Prereq: Sophomore classification*

The social construction of American sexualities from the colonial era to the present with particular emphasis on how ideas about sex and sexuality have shaped American public life, including education, public policy, party politics, and racial justice.

**WGS 458: Queer Fashions: History, Culture, and the Industry**

(Cross-listed with A M D). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and unequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**WGS 460: Seminar in Gender and Ethnicity**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq: Junior classification*

Selected readings of various authors, movements, eras, or genres. Readings in criticism; required research paper.

**WGS 488: Research on Gender and Leadership**

(Cross-listed with LD ST). (3-0) Cr. 3.

Research on gender and leadership in selected content areas (e.g., business, education, politics and public service, and popular culture). Following an overview of quantitative and qualitative methods and critical analyses of journal articles on gender and leadership, students work individually or in groups in selected content areas to write and present papers.



**WGS 490: Independent Study**

Cr. 1-3. Repeatable, maximum of 6 credits.

*Prereq:* Any two courses in WGS; Permission of Instructor

Independent study on a topic in Women's Studies.

**WGS 491: Internship**

Cr. 1-3. Repeatable, maximum of 6 credits. F.S.SS.

*Prereq:* Junior or Senior classification; Department Permission

Internship designed to provide an application of Women's and Gender Studies principles and methods in a workplace. To be arranged with an internal or external employer and conducted under the supervision of a member of the Women's Studies faculty.

**WGS 494: Women/Gender in Art**

(Cross-listed with ART H). (3-0) Cr. 3.

Issues of gender related to cultural environments from the Middle Ages to contemporary times in Europe and America. Feminist movement beginning in the 1970s and specifically gender issues in art that are becoming widespread in the artistic culture.

**WGS 499: Senior Thesis**

(3-0) Cr. 3. F.S.SS.

*Prereq:* Senior classification; Permission of Instructor

Senior thesis to be independently researched and written under the supervision of a member of the Women's Studies faculty.

**Courses primarily for graduate students, open to qualified undergraduates:**

**WGS 501: Contemporary Feminist Theories**

(3-0) Cr. 3. F.

Advanced study of current theoretical developments in Women's Studies in the U.S. and around the world. Examination of the epistemological bases of feminist scholarship.

**WGS 502: Advanced Seminar in Feminist Research Methods**

(3-0) Cr. 3. S.

Focus on feminist interdisciplinary research methods. Analysis of contemporary issues facing feminist scholars. Students conduct original research.

**WGS 510: Human Trafficking**

(Dual-listed with WGS 410). (Cross-listed with SOC). Cr. 3.

*Prereq:* WGS 201 or 3 credits in WGS at the 300 level or above

Issues related to human trafficking and modern-day slavery in the US and world. History of and concepts defining forms of violence experienced by trafficking victims and methods used to recruit and control victims. Students will learn how to educate others about this crime against humanity. Examines international, federal, and state legislation to prevent human trafficking. Only one of WGS 410 may count toward graduation

**WGS 525: Intersections of Race, Class and Gender**

(Dual-listed with WGS 425). (3-0) Cr. 3.

*Prereq:* WGS 201; 1 additional WGS course

Race, ethnicity, class and gender distinctions and intersections lead to inequitable distributions of power, social well-being, and resources. Explores how inequities are institutionalized and how multiple identities are experienced by women in daily life. Meets U.S. Diversity Requirement

**WGS 535: Gender, Globalization and Development**

(Dual-listed with WGS 435). (3-0) Cr. 3.

*Prereq:* WGS 301

Cross-cultural study of historical and contemporary dimensions of gender, globalization and development. Explores the interdependence of socio-economic and political aspects of globalization using feminist postcolonial and transnational frameworks. Analyses of case studies and activism in contexts of economic livelihoods, environmental justice, and cross-border migrations.

**WGS 545: Women's Literature**

(Cross-listed with ENGL). (3-0) Cr. 3. Repeatable, maximum of 6 credits.

*Prereq:* Graduate classification or 6 credits in literature at 300 level or above

Primary texts by women writers; historical, thematic, formal, or theoretical approaches; secondary readings; e.g., Nineteenth-Century Women Writers; American Women's Personal Narratives; Southern Women Writers of the U.S.

**WGS 558: Queer Fashions: History, Culture, and the Industry**

(Dual-listed with WGS 458 WGS 558). (Cross-listed with A M D). (3-0) Cr. 3. Alt. S., offered even-numbered years.

Focus on analyzing the dressed and undressed body of individuals in the queer and trans communities in various cultural contexts with a focus on material culture. Examine concepts related to gender and sexuality and the changing definitions and representations of individuals who identify in the queer and trans communities focusing on appearance, fashion, and the body. Historic and current representations of fashion, styles, and appearances will be analyzed and discussed. Attention to how sexuality and gender intersect with and shape other identities including race, ability, body size, and class. Examine the complex structures, systems, and ideologies that uphold discrimination and inequitable distribution of power and resources as related to the course material. Attention will mostly be given to North American perspectives. We will use material culture to explore how objects related to fashioning the body reveal lived experiences about the owners and consumers.

Meets U.S. Diversity Requirement

**WGS 586: Readings Seminar in Women's and Gender History**

(Cross-listed with HIST). (3-0) Cr. 3.

*Prereq:* Permission of instructor

Readings in women's and gender history.



### **WGS 590: Special Topics**

Cr. arr.

*Prereq: Permission of Women's and Gender Studies Program Director*

Independent study on a topic in Women's Studies.

### **WGS 594: Women/Gender in Art**

(Cross-listed with ART H). (3-0) Cr. 3.

*Prereq: Graduate classification or permission of instructor*

Issues of gender related to cultural environments from the Middle Ages to contemporary times in Europe and America. Feminist movement beginning in the 1970s and specifically gender issues in art that are becoming widespread in the artistic culture.

#### **Courses for graduate students:**

### **WGS 621: Pedagogies of Dissent**

(Cross-listed with EL PS). (3-0) Cr. 3. S.

*Prereq: EL PS 620*

Critical examination of the theoretical foundations of contemporary and historical pedagogical traditions that seek to challenge the status quo, expand justice, and deepen democracy.

## **World Film Studies (W F S)**

*Any experimental courses offered by W F S can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) ([http://](http://www.registrar.iastate.edu/faculty-staff/courses/explisting/)

[www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://www.registrar.iastate.edu/faculty-staff/courses/explisting/))

#### **Courses primarily for undergraduates:**

### **W F S 278: Introduction to Global Film**

(3-0) Cr. 3. F.

Introduction to the cinema of non-English speaking regions and cultures of the world through representative subtitled films, lectures, and readings.

Topics vary according to faculty interest. Emphasis on selected national cinemas and film as a mode of cultural expression as well as on diverse cultural contexts of cinema.

Meets International Perspectives Requirement.

## **World Languages and Cultures (WLC)**

*Any experimental courses offered by WLC can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) ([http://](http://www.registrar.iastate.edu/faculty-staff/courses/explisting/)

[www.registrar.iastate.edu/faculty-staff/courses/explisting/](http://www.registrar.iastate.edu/faculty-staff/courses/explisting/))

#### **Courses primarily for undergraduates:**

### **WLC 107: Introduction to Swahili**

Cr. 1. Alt. S., offered irregularly.

Basics of grammar and vocabulary within the context of the cultures where Swahili is spoken. For students whose native language is not Swahili. Taught in Swahili. Offered on-line. No

### **WLC 119: Introduction to World Languages**

(Cross-listed with LING). (3-0) Cr. 3.

Study of language diversity and the personal, social and political effects of diversity. Language families, attitudes toward language and language use, language and culture, multilingualism, foreign language learning, written codes, official languages, and language policy.

Meets International Perspectives Requirement.

### **WLC 205: World Religions**

(Cross-listed with RELIG). (3-0) Cr. 3. F.S.SS.

An introduction to religious studies – the academic study of religion.

Religions from around the world will be discussed, including their myths, rituals, beliefs, values, and social forms.

Meets International Perspectives Requirement.

### **WLC 210: Introduction to Asian American Studies**

(Cross-listed with ANTHR). (3-0) Cr. 3.

An interdisciplinary and chronological examination of Asian American immigration experiences from the early 19th century to the 21st century. Focus on how these immigration histories are accompanied by changing racial constructions. Discussion of racial stereotyping, the model minority myth, identity development, and efforts for social justice.

Meets U.S. Diversity Requirement

### **WLC 270: Cultures in Transition**

(3-0) Cr. 3.

An interdisciplinary introduction to a world region in a state of rapid social and cultural transition. Discussion of the history, social and political institutions, arts, economy, agriculture, and environment of the new nations.

Meets International Perspectives Requirement.

### **WLC 352: Religions of India**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

Study of texts, practices, beliefs, historical development, and mutual influence of a variety of the religious traditions of India. Emphasis on Vedic religion and the diversity of traditions of Classical Hinduism; survey of Buddhist, Jain, Sikh, and South Asian Islamic traditions.

Meets International Perspectives Requirement.

### **WLC 358: Islam**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

An introduction to Islamic religion, culture, and society from its origins to the present. Topics include the Quran, the Prophet Muhammad, Islamic theology and philosophy, Islamic history, and Islam in America.

Meets International Perspectives Requirement.

**WLC 359: The Quran**

(Cross-listed with RELIG). (3-0) Cr. 3.

*Prereq: ENGL 250 or Permission of Instructor*

A study of the Quran, the sacred text of Islam, with attention to its history, its major themes, and the diverse ways it is interpreted and applied.

Meets International Perspectives Requirement.

**WLC 370: Topics in World Languages and Cultures in English Translation**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370A: Topics in World Languages and Cultures in English****Translation: Global Sustainability**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370B: Topics in World Languages and Cultures in English****Translation: Middle East**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 370C: Topics in World Languages and Cultures in English****Translation: Global Urban Cultures**

(3-0) Cr. 3. Repeatable, maximum of 9 credits.

Topics vary according to faculty interest. Author, genre or period study, women's writing, cinema, or cultural studies of a non-English speaking world culture or cultures. Readings, discussion, and written work in English.

Meets International Perspectives Requirement.

**WLC 417: Student Teaching**

Cr. 8-12. F.S.

*Prereq: Minimum cumulative GPA of 2.5; Department Permission*

Evaluation of instruction, lesson planning, and teaching in the liberal arts and sciences. Admission to teacher education required.

**WLC 417G: Student Teaching: World Language**

(Dual-listed with WLC 517G). (Cross-listed with EDUC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**WLC 484: Technology, Globalization and Culture**

(Dual-listed with WLC 584). (Cross-listed with M E, MKT). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

**WLC 486: Methods in Elementary School World Language Instruction**

(Cross-listed with EDUC, LING). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language*

Planning, implementation, and assessment of standards-based, student-centered, and thematic instruction in the elementary (K-8) classroom. Special emphasis on K-8 students' communicative skills, cultural knowledge, and content learning.

**WLC 487: Methods in Secondary School World Language Instruction**

(Cross-listed with EDUC, LING). (3-0) Cr. 3. F.

*Prereq: 25 credits in a world language; Department Permission*

Theories and principles of contemporary world language learning and teaching. Special emphasis on designing instruction and assessments for active learning. Admission to teacher education required.

**WLC 491: Experiences Abroad: Learning to Think Globally**

(Cross-listed with INTST). (1-0) Cr. 1. Repeatable, maximum of 2 credits.

*Prereq: Minimum of 3 credits of study abroad and/or internship abroad*

Students returning from study abroad gain perspective on the personal, academic, and professional impact of their time spent abroad through readings and discussions. Students will be expected to make one presentation about the culture they experienced to an audience outside ISU. Offered on a satisfactory-fail basis only.

**Courses primarily for graduate students, open to qualified undergraduates:**

**WLC 517G: Student Teaching: World Language**

(Dual-listed with WLC 417G). (Cross-listed with EDUC). Cr. arr. Repeatable. F.S.

*Prereq: Minimum GPA of 2.5; Admitted to Educator Preparation Program, approval of coordinator during semester before student teaching*

Evaluation of instruction, lesson planning, and teaching in world languages, secondary grades.

**WLC 584: Technology, Globalization and Culture**

(Dual-listed with WLC 484). (Cross-listed with M E, MKT). (3-0) Cr. 3. F.

*Prereq: M E 484: Junior or Senior classification, M E 584: Graduate classification, MKT 484: MKT 340, MKT 584: Restricted to College of Business Graduate classification*

Cross-disciplinary examination of the present and future impact of globalization with a focus on preparing students for leadership roles in diverse professional, social, and cultural contexts. Facilitate an understanding of the threats and opportunities inherent in the globalization process as they are perceived by practicing professionals and articulated in debates on globalization. Use of a digital forum for presenting and analyzing globalization issues by on-campus and off-campus specialists.

Meets International Perspectives Requirement.

## Youth (YTH)

*Any experimental courses offered by Y TH can be found at:*

[registrar.iastate.edu/faculty-staff/courses/explisting/](http://registrar.iastate.edu/faculty-staff/courses/explisting/) (<http://www.registrar.iastate.edu/faculty-staff/courses/explisting/>)

**Courses primarily for graduate students, open to qualified undergraduates:**

**YTH 502: Foundations of Positive Youth Development**

Cr. 3. Repeatable. F.S.SS.

Fundamentals of positive youth development, theories, and principles utilized in the youth development profession. Ethical, professional, and historical elements of youth development as it has evolved toward professionalization.

**YTH 510: Adolescents and Their Families**

(3-0) Cr. 3. F.S.

Adolescent development as it is related to and intertwined with family development; reciprocal influences between adolescents and their families are examined. Working with youth vis à vis the family system will be highlighted.

**YTH 520: Positive Youth Development in Community Settings**

(3-0) Cr. 3. F.S.

Focus on the national emphasis of a strength-based or asset approach to community youth development, encompassing individual development (i.e., positive youth development) and adolescent interrelationships with environments. Emphasis is placed upon research, theory, and practice applied in communities throughout the U.S. Students will explore existing models, read theoretical and applied literature, and examine current community efforts as a basis for understanding community youth development.

**YTH 530: Youth in Cultural Contexts**

(3-0) Cr. 3. F.S.

Examination of the cultural context factors that affect youth from a holistic perspective within and outside the family unit. The course will provide an understanding of the cultural heritage of differing family structures and types. Students will explore the social and educational processes experienced by youth through in-depth reading, writing, discussion, critical listening, viewing of contemporary videos, and informal interviews with youth. Students will be encouraged to think critically about society and culture, gain further knowledge of how ethnic groups fit historically into society, and examine the results of how history has shaped the current cultural climate of the U.S.

**YTH 540: Youth Professionals as Consumers of Research**

(3-0) Cr. 3. F.S.

This course will help youth development professionals understand and evaluate research reports to reduce anxiety about applying research results and theories to practice. Specific emphasis will be on research and theory reports related to youth development.

**YTH 550: Youth Policy**

(3-0) Cr. 3. F.S.

Various federal and state policies designed specifically for youth. Students will examine how and why policies for youth are constructed. A guiding question that will be used to evaluate existing state and national policies is whether they contribute to, or act as, barriers to desired developmental outcomes.

**YTH 560: Youth-Adult Relationships**

Cr. 3. Repeatable. F.S.

The role of youth-adult relationships in promoting the positive development of youth. Attitudes and activities that support youth engagement and agency. Research and practice of mentorship, youth-adult partnerships, and youth leadership.

**YTH 570: Contemporary Youth Issues**

(3-0) Cr. 3. Repeatable. F.S.SS.

Issues faced by youth today and associated risk and resiliency factors. A different topic will be presented each year, with the course rotating among participating universities. Past topics have included Youth Violence, Youth and Appearance, Adolescent Health, Global Perspectives and Volunteerism. The course may be taken more than once, as long as the content is different each time.

**YTH 570L: Contemporary Youth Issues: Mental Health**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Understand optimal mental health in youth and how it can be promoted. Current theories and research related to optimal mental health and how promoting positive development is both similar to and different from preventing negative outcomes. Learn to assess a given youth development program in terms of its potential to promote positive mental health.

**YTH 570M: Contemporary Youth Issues: Working with Adolescents with Difficulties**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Examines cognitive, self, and social transitions during adolescence. Topics include issues of identity, society's understanding of adolescents, and how adolescents and their parents, siblings, peers, teachers, and society interact.

**YTH 570N: Contemporary Youth Issues: Understanding Normative Behavior in Immigrant & Minority Youth**

Cr. 3. Repeatable. F.

Explores the etiology of adolescent deviance using a positive, cross-national/crosscultural perspective. Includes implications of theory, empirical research, current prevention programs and needs assessments. Offers a look at deviance from different perspectives as well as a comparison of normative and non-normative development of youth.

**YTH 570P: Contemporary Youth Issues: Youth, Families & Technology**

Cr. 3. Repeatable. Alt. SS., offered odd-numbered years.

Understand the interconnectedness of technology and youth/family. Formulate constructive and realistic strategies to enrich the life of a family or a youth in a society heavily dependent on technology. Topics of the course include identity formation, privacy, race, class, gender, subculture, risky behavior, policing, education, globalization, health, and policies.

**YTH 570R: Contemporary Youth Issues: Sports, Youth and Society**

Cr. 3. Repeatable. Alt. SS., offered even-numbered years.

Examination of how sports and society helps us better understand what we value, how we become who we are, and how we may be able to realize social justice in a larger social context.

**YTH 580: Youth Development Personnel and Program Management**

(3-0) Cr. 3. F.S.

Introduction to the development, administration and management of youth-serving organizations.

**YTH 585: Design and Evaluation of Youth Programs**

(3-0) Cr. 3. F.S.

Theoretical, methodological, and pragmatic issues involved in conducting programs and scholarship. Overview of the program development process and outcome evaluation of children and family programs. Modes of outcome scholarship and their implications for community-based programs are discussed. Students will develop knowledge through participating in a community-based project involving the practical application of program design and evaluation methods.

**YTH 589: Grant Development and Management.**

Cr. 3.

Grant-getting process and an overview of what happens after a project is funded. The following topics will be covered: researching funding sources, generating cutting edge ideas, assessing needs, planning a project, establishing credibility, formulating a sustainable budget, designing an evaluation plan, managing the funded project, and disseminating project results.

**YTH 599: Creative Component**

Cr. arr. Repeatable. F.S.SS.

Nonthesis students creative component (e.g., a special report, capstone course, integrated field experience, annotated bibliography, research project, design, or other creative endeavor). A minimum of five credits of independent work is required on the programs of study (POS). Creative component format determined cooperation with the POS committee. Offered on a satisfactory-fail basis only.

**Courses for graduate students:****YTH 634: Youth Development**

(3-0) Cr. 3. F.S.

Introduction to the developmental period of adolescence. The theory and research of positive youth development will be the lens through which this developmental period is examined. The course will emphasize how the developmental tasks of this life stage are influenced by (and influence) family and home, school, peers, and other contextual forces. The course will help students recognize and become familiar with the major issues and transitions adolescents face as they successfully navigate this developmental stage by critically examining the theoretical and research literature.

**YTH 690: Advanced Topics**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor.*

Advanced topics.

**YTH 691: Internship**

Cr. arr. Repeatable. F.S.SS.

*Prereq: Permission of instructor.*

Supervised practice and experience in college teaching, research, professional experience. Offered on a satisfactory-fail basis only.

# IOWA STATE FACULTY

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## A

### **ABARCA, SAUL**

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